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OTONABEE REGION CONSERVATION REPORT

1964



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DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT
CONSERVATION AUTHORITIES BRANCH

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DEPARTMENT OF THE ARMS AND HERALD

REPORT OF THE COMMISSIONER

1895

BY THE COMMISSIONER

OF THE ARMS AND HERALD

A. J. C. BAKER

Commissioner of the Arms and Herald



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THE INDIAN RIVER NORTH OF WARSAW

DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT

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Minister

T. R. HILLIARD
Deputy Minister

A. S. L. BARNES
Director, Conservation Authorities Branch

OTONABEE
REGION
CONSERVATION
REPORT
1964



TORONTO
1964

Forty-five copies of this report
have been prepared, of which
this is Number 36

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INTRODUCTION

The Conservation Authorities Act, passed in 1946, was based on three premises: (1) that since water is the most important of the renewable natural resources, the most logical area on which to co-ordinate conservation work is a watershed or group of watersheds; (2) that the initiative must come from the local people; and (3) that if the local people establish a Conservation Authority and are prepared to carry out a program of conservation, they can receive considerable assistance from the Ontario Government in the form of technical advice and grants.

With the advent of this concept of personal and community responsibility in conservation, the Conservation Authorities movement was born, and the willingness of our people to undertake conservation in this way is indicated by the fact that in the past eighteen years 32 Authorities have been established, with a total membership of 468 municipalities and an area of 21,952 square miles. The population within watersheds on which Authorities have been established is estimated to be approximately 4,130,000, or roughly 70 per cent of the total population of the Province.

The first step in establishing a Conservation Authority is undertaken by the municipalities wholly or partly within a watershed. Two such municipalities must first by resolution petition the Government to call a meeting for the purpose of ascertaining whether or not an Authority should be established. Two-thirds of the number of representatives which all the municipalities in the watershed are entitled to appoint must be present to form a quorum. If two-thirds of those present vote in favour of establishing an Authority, a resolution is forwarded to the Government. The Authority is then established

(ii)

by Order-in-Council and under the Act becomes a body corporate, including, as members, representatives from all the municipalities in the watershed.

While some Authorities were brought into being because of flooding within their areas, all were aware of the necessity of carrying out such supplementary measures as improved methods of land use, reforestation, proper woodlot management, investigation of underground water supplies, wildlife studies and development of recreational facilities. But the Authorities are not equipped to carry out the extensive investigations that would indicate where such work should be done. Consequently the Conservation Authorities Branch of the Department of Energy and Resources Management undertakes to carry out the preliminary investigations as a service to the Authorities: to appraise, by means of surveys and reports, the conservation needs of each watershed, and to submit to the Authority a detailed report outlining the conservation measures that should be implemented.

Surveys may include work in five general fields: Land, Forest, Water, Wildlife, Recreation. The scope of the studies made in each of these subjects varies with the condition and needs of the area under survey.

The starting point for all surveys is aerial photography. Before the survey is commenced in the field, all such contributing data as maps, old records, photographs, unpublished reports and other useful sources are thoroughly explored and the pertinent information recorded. While the survey is in progress similar data are gathered locally, and agricultural representatives, zone foresters, municipal clerks, other officials and private citizens are interviewed for additional material.

The results of these conservation surveys, together with the recommendations based upon them, are set down in the reports presented to the Authorities and intended to

serve them as a guide in their work. The carrying out of any scheme is not the work of the Conservation Authorities Branch, because it is not an operating branch, although it stands by to interpret the report and give advice and assistance in carrying out the plans recommended in the report.

The Authority itself must assume responsibility for initiating the schemes which it considers most urgent; it must also make the approaches to government departments or other bodies from which it hopes to get assistance. If, for example, an Authority undertakes a scheme having to do with land use, it must seek assistance from the Department of Agriculture; if the scheme involves a forestry or wildlife problem, then branches of the Department of Lands and Forests are consulted. In the case of flood control, however, as the only provincial department engaged in hydraulic surveys is the Conservation Authorities Branch, whose staff is not large enough to carry through to completion the engineering works of several Authorities, the Authority must engage a consulting engineer to do the final engineering and designing and to carry the work through the construction stage. Similarly, when an Authority undertakes a scheme which has to do with recreation, it may have to employ men specially trained in this field.

As the work being done by Conservation Authorities is a new approach to the conservation problem in that the responsibility of carrying it out is left entirely in the hands of the Authority concerned, much direction and assistance from the Conservation Authorities Branch have been necessary. In the case of 27 of the Authorities, including the Otonabee Region, a member of the staff of the Department of Energy and Resources Management has been assigned to work in the watershed.

The Otonabee Region Conservation Authority was originally established, as the Otonabee Valley Conservation Authority, by Order-in-Council on July 9, 1959, and at that

time had jurisdiction over the watershed of the Otonabee River only. On March 24, 1960, at the request of the Authority and certain municipalities adjacent to its boundaries, the Authority was enlarged to include the watershed of the Indian River and its name was changed to The Otonabee Region Conservation Authority. A further enlargement took place on March 29, 1961, when the watersheds of the Ouse River and a number of smaller streams were also placed under the jurisdiction of the Authority.

In 1961 two sections of the Otonabee Region Conservation Report were issued: the Forest section and the Land section, including a special Wetland Study of the Cavan Bog. In 1962, two further sections were issued: Wildlife and Recreation.

While the information contained in the earlier reports is in the main still applicable, it must be remembered that even in so short a period as two or three years some changes have taken place. For example, farm pond assistance, which in 1962 was largely a Conservation Authority program, is now so much in demand that it has become a provincial program administered wholly by the Department of Agriculture.

The present report includes the earlier sections on Land, Forest, Wildlife and Recreation as originally published, plus certain additions. Two chapters have been added to the Forest section; these cover the Ouse Watershed, which was included in the Authority area by the 1961 enlargement.

Four chapters on the History of the Otonabee Watershed are included in this report. Unfortunately the author was transferred to other government work before this section could be completed. However, the material, even in its unfinished state, gives an interesting background to the study of the region's present needs and it has, therefore, been included.

RECOMMENDATIONS
STATED OR IMPLIED IN THIS REPORT

Land

1. That the Authority co-operate with existing organizations such as the Federation of Agriculture, Farmers' Union, Junior Farmers, 4-H Clubs, Soil and Crop Improvement Association, Women's Institutes and other groups to advance the cause of conservation and good soil management. . (Page 6)
2. That the Authority undertake demonstrations of various land improvement practices such as reforestation, gully control, pasture renovation and improvement, drainage, farm ponds and grass waterways. These can be carried out in several ways:
 - (a) On Authority Conservation Areas, and combined with recreational use of the land.
 - (b) On property purchased mainly for demonstration use.
 - (c) On privately owned land. The Authority can give assistance to landowners for carrying out specific conservation practices in return for the right to use the project as a demonstration. (Page 76)
3. That the Authority provide limited financial assistance, either for specific projects or as a general policy, for certain types of approved conservation work such as grass waterways. (Page 77)
4. That the Authority encourage landowners to improve their standards of agriculture by making greater use of the advisory services provided by the Department of Agriculture in
 - (a) Soil sampling (Page 45)
 - (b) Pasture renovation (Page 51)
 - (c) Erosion control (Page 53)
 - (d) Farm drainage (Page 55)
 - (e) Farm ponds (Page 56)
5. That the conservation values of the Cavan Bog be developed by
 - (a) Acquiring 2,500 acres of the bog as part of the Authority Forest (Page 62)
 - (b) Acquiring an additional 250 acres containing the most unusual plants as a Nature Reserve (Page 69)

- (c) Carrying out a detailed water-balance study of the bog. (Page 73)

Forest

6. That an Otonabee Region Conservation Authority Forest be established and that it be expanded through a definite program of annual additions and planting until as much as is feasible is acquired and reforested of the 63,043 acres of land mapped as suitable for this purpose on the original survey and the 39,701 acres mapped on the Ouse Watershed. (Pages 23, 69)
7. That the Authority encourage private reforestation by providing a planting service at nominal cost and by offering a planting subsidy for trees privately planted. (Page 26)
8. That the Authority establish woodlot improvement projects on its own properties or on private woodlots under agreements with co-operators in order to demonstrate the advantages of better forestry practices. (Page 28)
9. That the Authority encourage private owners in thinnings and improvement cuttings in their woodlots by investigating any possible markets for low-grade material and by purchasing any equipment, such as a wood chipper, which might aid woodlot owners in this work. (Page 33)
10. That the Authority investigate, publicize and urge the implementation of the best methods of protecting woodland from
- | | | |
|-----|----------------------|-----------|
| (a) | Grazing | (Page 33) |
| (b) | Fire | (Page 36) |
| (c) | Insects and diseases | (Page 38) |
11. That the Authority co-operate with schools, government departments and all other groups and agencies possible to publicize the need and methods of reforestation and woodlot management; and in particular that the Authority sponsor

tours, practical demonstrations and field days for this purpose. (Pages 30, 31)

12. That the Authority encourage and co-operate in research to find improved methods of managing plantations and natural woodlands and publicize results which would help private woodlot owners. (Page 30)
13. That the Authority encourage landowners to convert to productive forest such parts as cannot economically be restored to agricultural use of the 9,352 acres of scrub-land mapped on the original survey and the additional 2,099 acres mapped on the Ouse survey. (Pages 14, 65)
14. That the Authority urge the County of Peterborough to adopt a tree-cutting by-law to prevent slashing of woodlots in the Authority area. (Page 19)
15. That the Authority act as co-sponsor for
 - (a) The Tree Farm movement
 - (b) 4-H Forestry Clubs(Page 20)
16. That the Authority encourage the establishment of windbreaks, shelterbelts and snow fences. (Page 44)
17. That the Authority promote the adoption and use of cutting contracts by all parties engaged in logging on the watershed. It is further recommended that such contracts be in the form suggested in this report. (Page 50)
18. That the Authority encourage any marketing methods or organizations, including co-operatives, which will increase the owner's interest in better management by securing him a greater return for his woodland produce. (Page 58)

Wildlife

19. That the Authority publicize the possible improvements to trout streams by private owners in the Otonabee Region. (Page 6)

20. That the Authority carry out a demonstration project of stream improvement on a selected stretch of trout water lying in an area acquired by the Authority for other conservation work. (Page 6)
21. That the Authority urge the limiting of trout stocking to those waters which are shown in this survey to be suitable for trout and which can be proved to have present populations below the carrying capacity of the stream. (Page 6)
22. That the Authority enter into agreements with the Department of Lands and Forests whereby the Department would manage both the habitat and the hunting for wildfowl in any wetland areas acquired incidentally as a part of acquiring lands for reforestation or for other purposes. (Page 11)
23. That the Authority encourage landowners to construct ponds for fish and/or wildlife. (Page 27)
24. That the Authority encourage landowners to improve their land for wildlife by the methods described. (Pages 24-28)

Recreation

25. That the Authority enlarge the Warsaw Caves Conservation Area to the boundaries proposed. (Page 12)
26. That the Authority consider the possibility of acquiring the following proposed Conservation Areas:
 - (a) The Wallace Point Conservation Area (Page 15)
 - (b) The Mount Pleasant Conservation Area (Page 19)
 - (c) The Lang Mill Conservation Area (Page 22)
 - (d) The Selwyn Conservation Area (Page 26)
 - (e) The Cavan Bog Conservation Area (Page 27)
27. That the Authority conclude an agreement with the Trent Canal System for development of the River Road properties as Conservation Areas. (Page 28)

28. That the Authority publicize the Scenic Drive proposed in this report. (Page 29)

HISTORY

CHAPTER 1

INDIANS, EXPLORERS AND FUR TRADERS

1. Prehistory and Indians

The shores of Rice Lake must have been frequented from the earliest time by the first human inhabitants of the Ontario region. The lake, with its marshes and rice beds (smaller before the damming of the outlet at Hastings), its teeming populations of fish, shellfish, wildfowl, and muskrats, was bound to attract primitive peoples, whether still dependent on hunting and food-gathering, or already advanced to a primitive agriculture. There is clear evidence for a considerable concentration of at least temporary occupation, extending from early prehistoric times up to and beyond the arrival of the white man. Some of these traces are among the best known and most interesting Indian remains in Ontario. But the evidence of primitive man is not limited to these well-known sites; it is scattered all along the shores of the lake.

The area around the mouths of the Indian and Otonabee Rivers was particularly suited for Indian settlement. Although there were important locations on the south shore and its islands, the steep hills pressing close to the lake at some points on this side placed a degree of limitation on occupation. The more broken and gentler hills of the north shore and the deep estuaries of the rivers provided better locations for settlement, and the evidence indicates that, in every period, the chief centres on Rice Lake were located in the area between the Indian and the Otonabee.

The best known single relic of prehistoric occupation in the Rice Lake area is, of course, the complex of burial mounds that form the "Serpent Mounds Site", on Lot 7, Concession VII, Otonabee Township, on what is now called Roach Point. In 1940, Robert Paudash, son of the famous Mississauga chief of the same name, asserted that, according to his father, the Serpent Mounds were only representations of Mohawk totems,

erected as a victory trophy by the Mississaugas. This statement, which was published by the Ontario Historical Society the following year, helped to mislead many of the amateur archaeologists of the area.

The first recorded excavation of the Serpent Mounds was conducted during the summer of 1896 by the archaeologist David Boyle, and its results published in 1897 under the auspices of the Ontario Department of Education. At that time, apparently, Roach Point was called "De Zang's", or "Mizang's" Point*, supposed by some to be after the father of "Chief Paudash", whose name, however, is given by Robert Paudash as "Chenecbush". Mr. Boyle found the Mounds already considerably disturbed by previous digging, and his report denounces the "morbid depredations of diggers anxious merely to lay bare human remains, or to possess a skull". The investigation was made at the instance of Mr. H.I. Strickland of Peterborough, co-owner with Mr. G.W. Hatton of the property on which the mounds were located.

Although Boyle does not seem to have recovered any artifacts from the mounds, his report notes the discovery of two crouched burials, and his findings in the Serpent Mound proper are thus described:

"... Human bones were exposed within two feet of the surface, but like those of the egg-mound, all much decayed. Some of the boulders taken from this cut were all that a man could lift, but many of them did not weigh more than from ten to thirty pounds each. The placing of the earth was manifestly done by hand, layers and patches of dark soil being mingled with

* Possibly De Zeng. In March, 1819, "Frederick Augustus De Zeng", described as "of Smith's Creek in the Township of Hope", applied for a grant of land on which to establish a window glass factory. He was given 500 acres as a settler, on condition of erecting a saw and grist mill and the right to lease 300 acres "for the use of any works he may erect". He was also promised 100 acres for each "Family of Foreign Protestants", these grants to be confirmed after seven years, the period of naturalization. Nothing further has been found to connect De Zeng with Otonabee Township, but he may have settled there for a time.

yellow clay; beyond this there was nothing to indicate man's agency, but the proof yielded was ample. A slight examination was made at the head of the mound, the result being to show that here also comparatively recent burials had been made, but lower than eighteen inches there was no sign of bones."*

In discussing the probable origin of the Serpent Mounds, Mr. Boyle confined himself to a simple statement that they were man-made and that they undoubtedly antedated the arrival of the Huron-Iroquois, although he suggests that they might be attributed to some "old-time Algonkins".

The next examination of the Serpent Mounds was undertaken by Henry Montgomery, and his findings were presented in a paper read to the Canadian Institute, February 19, 1910. Montgomery estimated that the Mounds dated from approximately the tenth century A.D., and he was inclined to view their creation as a process of gradual accretion, due to successive burials. In addition to skeletal remains, the Mounds yielded a few artifacts on this occasion - a number of marine shells from the Gulf of Mexico, two potsherds, and a bone implement. Montgomery appears to have believed that interments were made after the burning of fires upon the ground, perhaps for several days, and probably for ceremonial or religious purposes.†

However, the first systematic and exhaustive examination of the mound group and related features was begun in the summer of 1956, under the auspices of the Royal Ontario Museum. An interim report, published in 1958, described the progress of the excavation as follows:

"Generally speaking, the effort has been mostly productive of burials. To date twenty-nine have been recovered, twelve of which came from various levels throughout the mound itself. Nine of these

* Boyle, David. Mounds: Ontario Annual Archaeological Reports (Toronto, 1895-1900), Vol. II, No. 2 (1896-97), pp. 23-24.

† Montgomery, Henry. Recent Archaeological Investigations in Ontario: Transactions of the Canadian Institute, Vol. IX, Part 1, pp. 1-10. Toronto, 1913.

were primary interments in a flexed position...Another primary burial showed overall cremation while a second found within a foot and a half of the surface in mound fill, was burnt about the head and neck. Two interments may be characterized as bundle burials while another secondary burial appears, except for the legs, to have undergone partial dismemberment. Various artifacts and refuse such as pottery fragments, silver, copper and shell beads, beaver teeth, projectile points, animal bone and mussel shells have been recovered but only in mound fill where they cannot be 'associated directly with the burials'."*

In one of the small oval mounds adjoining the Serpent Mounds, the archaeologists discovered a mass grave, containing at least seventeen primary and secondary burials. Two of these were flexed, and some dismemberment was evident.

Further scientific excavation in the modern manner was undertaken in 1959, under the auspices of the Royal Ontario Museum. The report on the Serpent Mounds, published in 1960, describes the further discovery of skeletons and artifacts in the western half of the 194-foot long Serpent Mound proper. A nearby pit burial was also opened, revealing "twenty-four disarticulated individuals, many of which could be termed bundle burials". The 1959 dig was mainly concerned with a large shell midden, or rubbish heap, near the mound group, above the shore of Rice Lake. This midden yielded a considerable quantity of cultural remains, including pottery, bone objects, and stone artifacts.†

Modern research, through the dating of carbon samples, appears to have provided us with an approximate date of 128 A.D. for the midden and the Serpent Mound. The skeletal remains, which are currently undergoing classification and analysis at the Anatomy Building of the University of Toronto, would seem to indicate a transitional stage in development

* Johnston, Richard B. The Findings After Two Years of Work at Serpent Mounds Site, Rice Lake, Ontario. Reprinted from Indiana Academy of Science, Vol. LXVI, 1958, pp. 96-97.

† Emerson, Ed. J. Norman. New Pages of Prehistory, 1959: Ontario History, Vol. LII, No. 1, pp. 55-56. Toronto, 1960.

between Donaldson Man, the most primitive specimen of Homo sapiens found in Ontario, and the more advanced Iroquoian type. These remains also reveal the ravages of caries, arthritis, spinal tuberculosis, and other afflictions, although the prehistoric Indians seem to have been taller than modern aborigines.

Most of the pottery discovered appears to be of Middle Woodland origin, with Point Peninsula affinities. However, a Late Woodland specimen and various Iroquoian samples were also collected. George Irving Quimby furnishes the following synopsis of Middle and Late Woodland cultural periods:

"In the Middle Woodland period, from about 100 B.C. to A.D. 800, there was a cultural climax brought about by the arrival of the Hopewellian Indians from the valley of the Illinois River in Illinois. Elaborate burial mounds were erected over the dead. There was widespread trade and commerce with distant lands. There were artistic achievements that were never surpassed by later Indian occupants of the region, and agriculture had its beginnings.

"In the Late Woodland period, from about A.D. 800 to 1600, there was an increasing differentiation of cultural groups in the region. During a particularly warm spell around 1000, some new groups of Indians entered the region from farther south via the Mississippi Valley and its tributaries, and other groups of Indians entered the region from the east. The Indians of this period made their living by hunting and farming."*

The Peninsular Woodland culture was among the cultural variations of the Late Woodland period. It originated among Indians who lived in the upper peninsula of Michigan, coastal Wisconsin, including the Door Peninsula, and the lower peninsula of Michigan and northern Lake Huron. These Indians depended for subsistence upon simple farming and, to about the same extent, upon hunting, fishing, and food-gathering. Peninsular Woodland villages were small, and appear to have been occupied only seasonally; they consisted of wigwams made of sapling poles covered with bark, skins, or mats. The

* Quimby, George Irving. Indian Life in the Upper Great Lakes, 11,000 B.C. to A.D. 1800, p. 7. Chicago, 1960.

Skeletons uncovered during the excavations.



The Serpent Mounds were built by prehistoric Indians about 2,000 years ago and were used as burial grounds.



An archaeologist carefully removing soil with a brush.

Peninsular Woodland culture was considerably less sedentary or agricultural than the apparently contemporary Lalonde culture of Ontario; Lalonde villages seem to have been of a palisaded, proto-Iroquoian type.*

From the archaeological evidence reviewed above, it would appear that burials occurred at the site of the Serpent Mounds for some time prior to the erection of the mounds themselves, after which further interments were made over a considerable period of time. This, and the further evidence furnished by the large adjoining shell midden, would indicate that the site enjoyed a special sanctity long before the mounds were built, and that it long continued to be a particular place of resort for the aboriginal population of the area.

During the summer of 1896, David Boyle and his assistants not only opened the Serpent Mounds, but also examined a number of other sites in the Rice Lake area. Although Boyle heard that a body had been exhumed at Gore's Landing, "when digging the foundation of Mr. Drayton's house", he dismissed it as probably of very recent date. Another report of skeletons led the archaeologists to the farm of Mr. James Miller, tenanted by a man named Spiers, "a little west of the Indian village of Hiawatha, and at the mouth of the Otonabee River", where they excavated a couple of mounds. Here, they found an exceptionally massive skull, two small celts, two deer-horn points, and a very well-made bone arrow, or knife, "the only one of the kind in our possession". A former Indian camping-ground was next examined. It was also located on the left bank of the Otonabee, near its mouth, and only about

* Ibid, pp. 88, 98.

three hundred yards from the "Miller mounds". Boyle thus describes the site, and his conclusions regarding it:

"...Beds of ashes and fragments of pottery were numerous, but there was an entire absence of flint. It is probable that these signs marked an occupation by people of more recent date than those who constructed the mounds, and it is also likely that the place was resorted to only during the harvest-time of the wild rice, which would account for the abundance of pottery..."*

The next site examined by the Boyle expedition was near the mouth of the Ouse River at Cameron Point, "a high bluff on the north side of Rice Lake and at its eastern end", where three partially eroded mounds yielded twenty skeletons (sixteen of them "intrusive" burials) and a couple of artifacts. In addition to these funerary relics, W.G. Long, Boyle's assistant, examined the extensive shell middens in the area, discovering numerous potsherds and artifacts, and concluded that Cameron Point seemed "to have been a permanent home, or at least a favourite camping ground of the Indians".

Acting on further information from Mr. F. Birdsall, Long proceeded to uncover traces of Indian and French occupation on Birdsall's Point. Long, "while walking on a large sand-bar lying between the bay and a large swamp to the north", had the good fortune to discover an unusual type of mealing-stone, and a large boulder apparently used as a whetstone. Boyle seems meanwhile to have been visiting some mounds on East Sugar Island, where he discovered a number of skeletons and "flexed" burials and several artifacts, including copper beads and a copper axe or chisel.

On receipt of information from Mr. J.H. Sriver, editor of the "Hastings Star", Boyle next examined three mounds on the farm of Mr. John Preston, Lot 6, Concession IX, Township of Asphodel, on the left bank of the Trent below Hastings. His findings from this site included several skeletons in "various positions", one cremation, an arrowhead,

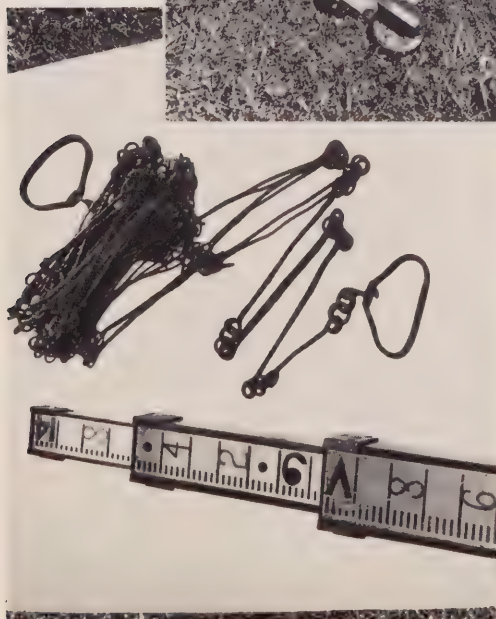
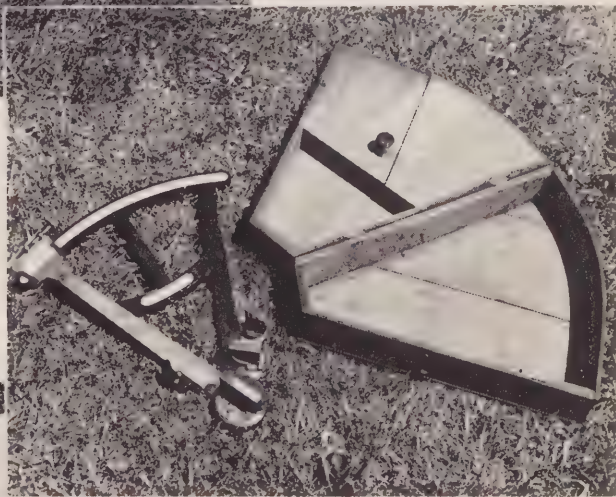
* Boyle, loc. cit., p. 33.

Richard Birdsall's telescopic level and tripod.



This staff-compass was used by Richard Birdsall from 1820 to 1840.

His quadrant and case.



Chain composed of wire links and sectional rod used by Richard Birdsall.

a potsherd, and a pierced sandstone disc. The archaeologists appear to have made a completely fruitless trip to "an island north of Gore's Landing" (probably West Sugar, Black, or Sheep Island), in order to examine "a curiously constructed earthwork". Mr. Boyle gives the following amusing explanation of this alleged relic of Indian occupation.

"...Mr. Hunter and myself were afterwards assured, on what we thought good authority, that some whimsically disposed old settler once resolved to build himself a house on this spot, but the idea was for some reason abandoned after the cellar was built."*

Inspired by "numerous vague reports regarding the existence of mounds, and graves on the other islands in Rice Lake", the Boyle expedition completed its examination by visiting "all those lying east of Hiawatha (except Spook Island) and one between Hiawatha and Gore's Landing". However, this examination revealed only some possible corn-caches on Upper Foley Island, and potsherds and flint flakes on the west side of Foley Point.

Boyle explicitly mentions that he did not visit Spook Island, and no later archaeological reports that have been examined take any notice of the local belief that the island is a former Indian burial-ground. Nor does Boyle mention the local belief that there was an ossuary on Paudash Point, although this belief has the support of at least some chance finds of pottery and artifacts in the vicinity.

There have been numerous other chance finds of Indian relics in the Rice Lake area, which have never been officially reported or examined. One of these was a skeleton, buried in the "flexed" position, and discovered by workmen in a gravel-pit near Pengelly Landing, about 1930. Mr. Wesley Hibbard, now the proprietor of "Hibbard's Camp", was among the eyewitnesses to this find, which was examined by Provincial Police Constable Cary of Port Hope and by the late Dr. Turner of Millbrook, who acted as Coroner.

* Boyle, loc. cit. p. 37.

A widely publicized archaeological discovery near the Otonabee region in recent years was that of the "Peterborough Petroglyphs", a series of pictographs ground into sandstone. The site of the petroglyphs, which are located in Burleigh Township, "about four miles north-west of the eastern extremity of Stoney Lake...upon the east side of Jack's Creek, about two miles north of a small, marl lake known as McGinnis Lake", is isolated and nearly inaccessible. Although a "Preliminary Report on the Peterborough Petroglyphs" was prepared by Paul W. Sweetman in 1955, no definite chronology or cultural connection has yet been established for this interesting find.*

It seems likely that the shores of Rice Lake were continuously occupied until about the seventeenth century, when pressure from the expanding Iroquois Confederacy forced the inhabitants northward. Samuel de Champlain, in describing his journey down the Trent in September, 1615, leaves no doubt that by that time the country had become depopulated, or at any rate devoid of permanent inhabitants:

"...It seems...that all these tracts were in former times inhabited by savages, who were subsequently compelled to abandon them from fear of their enemies...

"Stags and bears are here very abundant. We tried the hunt and captured a large number as we journeyed down..."†

After about 1660, however, the Rice Lake area seems to have been occupied to some extent by one of the Five Nations, the Cayugas, who crossed Lake Ontario in order to establish outposts against the advancing Ojibway.** One of

* Sweetman, Paul W. A Preliminary Report on the Peterborough Petroglyphs: Ontario History, Vol. XI, VII, No. 3, pp. 102-108. Toronto, 1955.

† Grant, W.L., Ed. Voyages of Samuel de Champlain, 1604-1618, p. 288. New York, 1952.

** Or Chippewa. The two names are variants of the name of this "nation", but "Chippewa" came to be applied to various branches or "totems" who occupied south-western Ontario. Later "Ojibway" was used for tribes of the same stock still farther west.

the most important of these outposts was the Village of Kentsio, which first appears on a French map ascribed to Joliet but apparently not earlier than 1673. On this map, Rice Lake is shown drained by the Trent, and with a village, "Kentsio", on its north-eastern shore in the approximate direction of Birdsall's Point. In the Raffeix map of 1688, "Quinchio" appears on the south shore of the lake, near Bewdley, or at Sackville's Creek, the end of the Trent portage. The map engraved by Bellin to illustrate Father Pierre Charlevoix's "Journal d'un Voyage", which is called by Mr. Percy J. Robinson "the most accurate of the printed maps" of the region, has "Lac Quentio" for Rice Lake. A later French map, apparently modelled on the Charlevoix-Bellin Map, also calls Rice Lake "L. Quentio".*

About the beginning of the eighteenth century, the Cayugas were compelled to withdraw from the Rice Lake region, under pressure from the Ojibwa-Algonkins. By 1744 the Village of Kentsio had disappeared from the maps, although Rice Lake continued to bear its name. The particular branch of the Ojibwa-Algonkins that wrested our area from the Cayugas was the Mississauga. In his account of the Mississauga conquest, based entirely upon tribal tradition, Rober Paudash gives an interesting, if not entirely reliable, description of the Iroquois retreat through the Otonabee region, in which the vanquished Indians are said to have been "Mohawks":

"...After various skirmishes the Mohawks continued their retreat down the valley of the Otonabee, or Trent, to where they were settled in numerous villages along the River, Otonabee, and on Rice Lake. They made their first real stand at Nogojiwanong, which was the original name of the town of Peterborough, meaning the place at the end of the rapids; Katchewanook, above the present village of Lakefield, meaning the beginning of the rapids. A sharp skirmish took place here upon what is now known as Cemetery Point, the Mohawks being worsted

* Robinson, Percy J. Toronto During the French Regime, maps facing pp. 20, 32, 76. Toronto, 1933.

and retreating farther down the river, making, however, a determined stand at the mouth of the river, while the Mississagas encamped at Onigon, now known as Campbelltown; the word Onigon meaning in Mississaga, 'the pulling-up of stakes', because the Mississagas, coming too closely upon the entrenched Mohawks, as they found when they had made their encampment, pulled up their stakes and retreated farther up the river. After great preparation, an attack was made by the Mississagas, both by land and water, and the Mohawks were driven, after a battle, in which no less than one thousand warriors were slain, down Rice Lake to what is now known as Roche's Point. Great quantities of bones and flint arrow-heads are found at the site of this battle even to this day. At Roche's Point there was a Mohawk village,..."*

Continuing his narrative, Robert Paudash relates that the Mississaugas then proceeded to drive the Iroquois away from Roach Point. The "Mohawks" turned at bay at "Quegeeing" (Cameron Point), but suffered another severe defeat. The Iroquois continued their retreat down the Trent to "Onigaming, the famous carrying-place, where the Murray Canal now is, being the portage across from Lake Ontario into the Bay of Quinte, and from there into their own country". While resting at "Onigaming", the Mississaugas are said to have sent a war-party to exterminate an Iroquois band near "Chuncall" (Moir Lake).†

The Mississaugas had a less developed economy than the Iroquoian tribes, closer to that of primitive, wandering hunters. They grew corn and vegetables on river flats

* Statement by Robert Paudash, prepared by J. Hampden Burnham, Esq., Peterborough, for Ontario Historical Society, Papers and Records, 1905. Quoted by: Guillet, Edwin C. The Valley of the Trent, p. 11. Toronto, 1957. There is no documentary evidence of Iroquois (Five Nations) much northward of the Trent-Lake Simcoe water route, nor does archaeological evidence of such occupation appear to have been found. The Confederacy had, however, been using these hunting grounds and fighting the Ojibway near Georgian Bay. Paudash appears to condense the events of a number of years into a relatively short period. The Mississauga occupation began after 1660 and was complete by 1700.

† This account of the final struggle for control of the Trent system may record some actual events for which there is no documentary evidence, but the area mentioned had been occupied by Cayugas and Oneidas at least thirty years before these events. However, a Mohawk war-party may have been involved in the fighting.

and had semi-permanent villages near their fields; but they were in the habit of deserting these for long periods, all the families moving together to some location where the hunting, fishing, or food-gathering was particularly good at that season. On these migrations, they followed the same trails and camped in the same places, often burying their dead close by the camp site. Consequently, relics of the Mississauga occupation are both numerous and widely scattered. When it was safe, the Mississaugas were in the habit of wandering in small bands, and we hear of single families living alone in the woods. Each band would have its favourite location to which it returned regularly and which it occupied for some time. The Mississaugas' political organization was much looser, and their villages were likewise more primitive, than those of the Iroquois whom they displaced. These villages were easily removed to a new site in the same vicinity when sanitary conditions made this necessary.

2. Exploration and Trading, 1615-1815

The first European visitor to the Otonabee region was probably Samuel de Champlain, in the autumn of the year 1615. Champlain had decided to join forces with the Hurons, and on September 8 he set out with a large war-party for the Iroquois country, from the vicinity of Lake Simcoe. Passing Fenelon Falls, the expedition appears to have proceeded in the direction of Pigeon Lake. From there, the allies probably entered Buckhorn Lake, by Gannon's Narrows, continuing through Harrington Narrows into Lake Chemung.

The Indians were in the habit of making fairly long portages, in preference to water routes requiring several short "carries". We know that there was, much later, an "Indian foot path" to the Otonabee, from the site of Bridge-north to the site of Peterborough. This same route was probably followed by the Hurons on this occasion, since frost had already begun to appear and they were anxious to complete their raid before the onset of cold weather. Champlain's

cursory account of this part of their route leads us to believe that they must have passed through Rice Lake rather hurriedly:

"...We also passed several lakes of considerable size, through which the river passes. The latter is large and very abundant in good fish."*

In describing our area in general, Champlain remarks on the apparent depopulation of the country, already noted, and on the ornamental appearance of the trees along the river banks. The latter observation refers, of course, to the presence of those pockets of savannah known to later settlers as plains. He also notices the abundance of wild grapes, which were later to give their name to East and West Grape Islands, in Rice Lake. Large and small game was likewise plentiful, besides "many cranes, white as swans, and other varieties of birds like those in France". Finally, he noticed that the "country would be very pleasant when cleared up".

By the end of October, however, lack of reinforcements compelled the Hurons to consider a retreat. Retracing their steps, they held a second hunt, probably in Hastings or Lennox County where Champlain, who had been wounded in the Iroquois country, became temporarily separated from his companions. The entire party then seems to have returned home without further incident, carrying packs and hauling sledges along the ice of the Trent. However, Champlain's vagueness concerning this winter route makes any close speculation almost impossible.

"On the fourth day of December we set out from this place [i.e., the scene of the hunt], walking on the river, lakes, and ponds, which were frozen, and sometimes through the woods. Thus we went for nineteen days, undergoing much hardship and toil..."†

* Grant, W.L., Ed. Voyages of Samuel de Champlain, p. 288.

† Grant, W.L., Ed. Voyages of Samuel de Champlain, p. 301.

In the two centuries that followed Champlain's visit, there appears to have been no very extensive penetration of the Otonabee region by Europeans. In 1668, during the period of Iroquois occupation, the Sulpicians opened their mission at Quinte. It is highly probable that some of the Sulpician Fathers may have journeyed through the area, although there is no explicit reference to this effect. Similarly, there is no documentary evidence of French traders in the Otonabee region, although their presence may be inferred from archaeological evidence, as has been noted. There is also an unsupported local tradition of a French trading-post at Port Hope. Although, under the British regime, several trading licences were issued for the Bay of Quinte, none seems to have been issued for Rice Lake or the Otonabee. However, it is possible that some of the Quinte traders may unofficially have extended their operations as far as our area.

This apparent neglect of the Otonabee region was due to the greater popularity of the Toronto "carrying-places" and the Lake Ontario route. In fact, a letter from Benjamin Frobisher to the Hon. Henry Hamilton, dated May 2, 1788, indicates that the Trent route must have fallen into almost complete disuse by that time:

"Since I had the Honour to receive your letter of the 10th of March, I have made every enquiry in my power, Not only in Town but in different Parts of the Country, respecting the practicability of a communication from Lake Ontario to Lake Huron, and I am sorry to say, all my endeavours to acquire knowledge of it are far from satisfactory. I have seen several persons who have gone from hence to Lake Huron by the carrying place of Torronto [sic.], but have only met with one who has set out from the Bay of Kentie, and that so far back as the year 1761, and the knowledge he seems to have of the country he travelled through I consider as very imperfect. I have however laid it down in the inclosed sketch, more to show that there is such a Road, than any opinion I have of its being Correct. I am told the Lands from the Bay of Kentie to Lake La Clie [Simcoe] abound with good Wood and are generally fit for Cultivation; there are several villages of the Mississagues on different parts of that Road who

raise Indian Corn and other grains, and whose friendship it will be necessary to Cultivate, if upon survey it should be found practicable, but if I may rely on information, there is very little probability of establishing in that quarter a Communication for Boats or Large Canoes on account of the Water being generally very shallow between the different Lakes, except in the Spring, and even then it is described to me as being insufficient for large Canoes, not to mention the Carrying Places which are Six or Seven in Number to reach Lake La Clie, and I am told three of them are three leagues [$7\frac{1}{2}$ miles] in length; I am, however, informed that to the distance of the Rice, or the folle avoine [wild oats] lake, from the Bay of Kentie, there is plenty of water for Boats of any Burthen..."*

Frobisher does not seem, on the whole, to have been greatly impressed with the possibilities of the Trent-Otonabee route, though his description is fairly accurate.

3. The Indian Village at Hiawatha

As we shall see in the next chapter, the Mississaugas, by a provisional treaty signed on November 5, 1818, and later confirmed, surrendered a large tract of land to the British Crown, including the Otonabee region. It is interesting to note, however, that the third of the six Indian signatories was "Pahtosh, Chief of the Crane Tribe". This "Pahtosh" may have been a nephew or younger brother of Cheneebeesh (born about 1765), who, according to his grandson, Robert Paudash, was "the last Sachem or Head Chief, of all the Mississagas". At any rate, he cannot have been "Captain" Paudash, Robert's father, who can have been no more than an infant in 1818.

Catherine Parr Traill, writing in 1836, gives a highly complimentary description of the local Mississaugas, who at that time used frequently to trade with the settlers, offering game, grass baskets, and birch-bark containers. The men apparently continued to use blunt arrows in hunting water-fowl. European dress was popular, particularly among the

* Quoted by Robinson, Toronto During the French Regime, p. 162.



Mrs. Traill's house at Lake-field, from the south-west.



An original log house, said to be 144 years old, $2\frac{1}{2}$ miles north of Warsaw.

This large stone house, which may date from before 1840 and was improved about 1860, is near Bridgenorth.



women. However, Mrs. Traill was most favourably impressed by the Indians' general Christian piety and strict observance of the Sabbath.*

Bishop Strachan, during his pastoral visit of 1840, found three Indians on the south shore of Rice Lake, butchering two deer which they had killed on one of the islands.

On the whole, the Indians' relations with the white settlers were fairly peaceful and cordial, although the aborigines were not particularly industrious, and were occasionally violent. An example of the friendly relations with the settlers was the intercession of Charles Fothergill with Sir Peregrine Maitland, on behalf of an Indian boy. In a letter dated September 26, 1820, Fothergill pleads for clemency for the unfortunate, who had been condemned for shooting a playmate, although, as Fothergill thinks, the shooting may have been entirely accidental:

"I am aware of the impropriety to say the least of it, of attempting to interceed in a matter of such mighty importance - but also as I was absent, by reason of imperious necessity, when the poor Indian boy was tried for shooting his play fellow and as I know the Indian boy very well - on account of his having assisted my servants and having been fed out of my kitchen one whole winter - I have ventured, however presumptuous and out of season it may appear, to state in his behalf 'that I have always found him remarkable for his pleasant and obliging disposition and I never saw anything of that savage disposition which has been attributed to him - I also know that the gun which was the fatal weapon and was a very unsafe and bad one and would go off with the smallest touch or even shake -

"I dare not say much on such a subject - but this I well know that should your Excellency extend mercy to this unfortunate youth it would be productive of the best results - and your Excellency would have the happiness and prayers of hundreds, both Christians and Indians."†

* Traill, Catherine P. *The Backwoods of Canada*, pp. 162-170. London, 1836. In the 1840's Indians from Rice Lake and beyond used to come frequently to camp on the Fortune (Meadow's) Farm west of Dale. Mrs. Edwin Hill notes two occasions on which her children were taken "to see the Indians at Mr. Fortune's" about 1845-48. This camp was near the point where a trail from Sackville's Creek would reach the Ganaraska.

† Dominion Bureau of Archives, Ottawa. Upper Canada Sundries, 1820.

The influence of the white traders upon the Indians varied, and in some cases there was definite exploitation of the aborigines. Peter Smyth operated a trading-post at Port Hope until 1791 after which he turned it over to a partner, Lawrence Herchimer. It is altogether probable that Smyth wintered occasionally in the Otonabee region. After the arrival of settlers in Port Hope in 1794, Herchimer left the establishment there in charge of Myndert Harris, and moved to the post near Hiawatha, which may already have been founded by Smyth as a wintering-post. Poole erroneously describes Herchimer, who seems to have been an immigrant from New York, as "an intelligent Indian"*. As late as 1816, a Lawrence "Herchimer" is found in partnership with a "Peter Smyth" at Kingston, where they were concerned with the construction of the steamer Frontenac, the first steamer on Lake Ontario.

The trading-post at Hiawatha afterwards passed into the possession of Captain Charles Anderson and seems to have been continued by his son. There appear to have been other white men trading with the Rice Lake Indians, and some of these traders were less scrupulous than the Andersons. However, references to malpractices are not specifically confined to Hiawatha proper. On March 8, 1828, the Rev. William Case felt obliged to write to Egerton Ryerson concerning the plight of Hamilton Biggar, who had opened a Methodist mission school at Hiawatha the previous November. It appears that "Mr. E.", a trader of "intemperate habits", had threatened "Bro. Biggar", who was lame, with a beating, or worse. The Rev. Mr. Case advised the immediate intervention of "Bro. Perry or Bro. McCarty", and describes the situation as critical to the success of the school:

* Poole, Dr. Thomas. History of the Town of Peterborough and the County of Peterborough, 1867.

"It appears that Mr. E. was offended because the Indians did not trade with him, and he suspected first, that Bro. Biggar, and then that I had persuaded the Indians not to trade with him. His suspicion seems to have arisen from the circumstance of our taking out provisions to supply the wants of the children while at school & while their parents were gone on their hunt. Now, as we have given no instructions to the Indians whatever about trading with Mr. E., so we have nothing to do with Mr. E. relative to our duty to the Indian School and which we shall pursue without any instructions from him whatever."*

An even more unsavoury incident is recorded by W.H. Smith, who relates that a Mr. Roach, a trader on Rice Lake, "made up an account, in 1839, against the Indians there settled, of £700". In order to make a case that would withstand legal scrutiny, Roach appears to have obtained the signature of a large number of Indians, "men, women and children", to a confession of judgement. After taking out judgement against the Indians' property, Roach proceeded to demand further compensation from Government. Fortunately for the Indians, however, the Court of Queen's Bench, upon discovering that most of the signatures on which Roach based his case were either fraudulently obtained or actually forged, proceeded to set aside the earlier judgement.†

Emma Jeffers Graham, a daughter of Rev. Willington Jeffers, who served the Hiawatha mission from 1857 to 1860, relates that the local Indians were being supplied with rum at that time by an unnamed half-breed, who finally succumbed to tuberculosis. The Indian converts appear to have denied him burial in the churchyard.**

The Methodist mission village at Hiawatha was probably established in order to remove Indian converts to

* Sissons, C.B. Egerton Ryerson; His Life and Letters, Vol. I, pp. 73-74. Toronto, 1957.

† Smith, W.H. Canada: Past, Present and Future, Vol. II, p. 501. Toronto 1851. "Mr. Roach" may have given his name to "Roach's Point".

** Quoted by Guillet, op. cit. from Transactions of the Women's Canadian Historical Society of Toronto, 1916-17. Guillet, op. cit., p. 22.

Christianity from proximity with their less civilized fellow-tribesmen, and its foundation preceded that of the Reservation there. The first land purchased for the Mississaugas at Hiawatha was a 400-acre tract comprising Lots 4 and 5, Concession X, Otonabee Township. This sale was made by John Steele and George Buller, on February 8, 1829, to Samuel Peters Jarvis, Chief Superintendent of Indian Affairs, who resold it to the Crown for the nominal sum of five shillings (currency=\$1). Just before 1830, the idea of a town at the mouth of the Otonabee seems to have been given up in favour of an Indian Reservation.

On February 5, 1831, an Order-in-Council formally transferred the town plot reservation on the Rice Lake and River Otonabee to "the Reverend Richard Scott, of the Township of Otonabee; the Revd. Alexander Bethune, of Cobourg; Charles Anderson, and Charles Rubidge, both of the Township of Otonabee, Esquires,...; and the Honorable George Herchmer Markland, of the City of Toronto". Markland may have been a relative or descendant of the trader, Herchimer. At any rate, these five men were named as Indian Trustees:

"...To have and to hold the said parcel or tract of land...upon the trusts, nevertheless, and to and for the uses, interests and purposes following, that is to say, in trust to hold the same forever hereafter to and for the benefit of the Indian tribes in this Province, and with a view to their conversion and civilization..."

Further purchases for the Hiawatha Reservation ensued. On March 11, 1836, James Givins, of the Indian Department, purchased Lot 9, Concession X, Otonabee Township, for £75, Provincial Currency, reselling it to the Indian Trustees on April 9 for the tidy sum of £200, Provincial Currency. Further acquisitions were made as late as 1845.*

* Canada: Indian Treaties and Surrenders, 1680-1890, Vol. I, Nos. 43, 54, 55, 74 & 84, pp. 108-111, 129-132, 132-133, 197-199, 218-220. £1 Provincial Currency = \$4.00 Silver. The lot purchased by Givins had been sold as a Crown Reserve to the Canada Company in 1826. The reasons for the advance in price are not clear.

Emma Jeffers Graham, already cited, gives an interesting picture of Indian life at Hiawatha in the years 1857-1860. The Mississaugas seem, by that time, to have adopted a garb somewhat similar to the French-Canadians, and at least one of them, Gervase Smith, had a house "like white folks". During this period, the appearance of a comet, in 1859, is reported to have thrown the Indians into a state of excitement bordering on panic.

By 1865, according to Dr. Thomas Poole, Hiawatha consisted of fourteen or fifteen houses, with a total population of about 140. The church, which was frame on a stone foundation, was being served by Mr. Gilmour and, periodically, by the Methodist minister at Lakefield. There was a day school with boardinghouse attached, and about half of the twenty pupils seem to have boarded. A small farm was attached to the school, which was taught by James Edwards from 1838 to 1843 and by Mr. and Mrs. Schofield "for the last 16 or 17 years". The name "Hiawatha" appears somewhat anomalous, and must have been given some time after the appearance of Longfellow's poem, since Hiawatha was an Iroquois, and not an Ojibwa, hero.

Special Note: Acknowledgement and thanks are due to Dr. James Anderson of the Faculty of Medicine, University of Toronto, for his valuable assistance and information regarding archaeological discoveries made at the Serpent Mounds Site.

CHAPTER 2
SETTLEMENT, 1817-1857

1. The Indian Treaties

It had been the intention of the British Government, when negotiating the treaty of 1783 with the Mississauga Indians, to purchase all the lands from the Gananoque to "Toronto". However, not enough of the Mississauga chiefs had assembled in council for this purpose, most of those from west of the Trent being absent. Consequently the purchase, which was signed on October 9, 1783, was carried only as far west as the River Trent.*

It was not until August, 1788, that a council of chiefs, summoned by Lieutenant-Colonel John Butler, ceded the land from the Trent to the River Etobicoke. In a letter dated August 26, Butler describes his negotiations with the Indians and the boundaries of the purchase:

"I called them to Council, and made a Proposal to purchase all the Lands to the Bay of Quinty, and as far back as Lake La Clay /Lake Simcoe/ and the Rice Lake, which, after two or three meetings, they agreed to..."†

The northern boundary of this purchase was left vague, for no definition of the line from Lake Simcoe to Rice Lake was made then, or for more than 38 years later. The Indians with their general vagueness about geography, and their liking for boundaries clearly defined by conspicuous natural features such as lakes or rivers, wished the line to run from Lake Simcoe to Lake Scugog and thence to Rice Lake.

William Hambly, when surveying Darlington and the township behind it (Cartwright) in 1793, added this passage to his field notes:

* See the correspondence of Major Ross with Governor Haldimand, published in the Ontario Historical Society Papers and Records, Vol. XVII.

† Ontario Bureau of Archives Report, 1905: No. 41, p. 410.

"...here Mr. Sturgis wished me to leave the line Mr. St. John [Jean Baptiste Rousseau, of the Indian Department, trader at Port Oshawa and the Humber] having told him it would cause much trouble with the Indians to proceed the Purchase extending no farther to the North, than from Lake La Clay to Chebotequiore [Scugog] and to Rice Lake."*

However, Clarke and Hope Townships, as laid out at that time and later surveyed, ran somewhat farther inland than a direct line from the west end of Rice Lake to any point on the eastern shore of Lake Scugog. If the boundary was taken as following the Trent waterway, the area behind Hope and Clarke would be greatly extended. This does not seem to have been acceptable to the Indians; but they were incapable of grasping the significance of straight lines on a map, and there was no marked natural boundary of the kind they favoured.

It was this ambiguity that allowed the laying out in 1816-17 of the townships behind Clarke (Manvers) and Hope (Cavan), although the matter was not finally settled until the signing of a Provisional Treaty with the Mississaugas at Smith's Creek (Port Hope, after 1819) on November 5, 1818.

This defined the boundaries of the new purchases as follows:

"...A tract of land situate between the western boundary line of the Home District, and extending northerly to a bay at the northern entrance of Lake Simcoe, in the Home District, commencing in the western division line of the Midland District at the north-west angle of the Township of Rawdon; then north sixteen degrees west thirty-three miles, or until it strikes the line forty-five; then along the said line to a bay at the northern entrance of Lake Simcoe; then along the water's edge to the entrance of Talbot River; then up Talbot River to the eastern boundary line of the Home District; then along said boundary line south sixteen degrees east to the north-west angle of the township of Darlington, Clarke, Hope and Hamilton to the Rice Lake; then along the southern shore of said lake and of the River Trent to the western division line of the Midland District; then north sixteen degrees west to the place of beginning, containing about one million nine hundred and fifty-one thousand acres..."

* Ontario Department of Lands and Forests: Survey Records. Original Note Book, No. 233.

By the terms of the Treaty, the Mississaugas were guaranteed an annual payment of "seven hundred and forty pounds currency in goods at the Montreal price". The following provision was made for the annual distribution of the treaty gifts:

"...Every man, woman and child to receive to the amount of ten dollars in goods at the Montreal prices, so long as such man, woman or child shall live, but such annuity to cease and be discontinued to be paid in right of any individual who may have died between the respective periods of payment and the several individuals then living, only, shall be considered as entitled to receive the yearly payment of ten dollars in goods as above stated."

William Gruet acted as interpreter on this important occasion, and the Treaty was signed for the Crown by "the Honourable William Clause, Deputy Superintendent General of Indian Affairs". The Mississauga signatories were: "Buckquaquet, Chief of the Eagle Tribe; Pishikinse, Chief of the Rein Deer Tribe; Pahtosh, Chief of the Crane Tribe; Cahgahkishinse, Chief of the Pine Tribe; Cahgagewin, of the Snake Tribe; and Pininse, of the White Oak Tribe". These signatures were witnessed by William Gruet and two other members of the Indian Department, J. Givins and William Hands, Sr.*

2. The System

When the war with the United States ended in 1815, settlement along the north shore of Lake Ontario was still partial and uneven. In Hope Township, the first five concessions were settled to some extent, but the back concessions had been granted to absentee owners in large holdings and had as yet hardly been penetrated, even by tenants or squatters. In the adjoining townships, settlement in many

* Canada: Indian Treaties and Surrenders, 1680-1890, Vol. I, No. 20, pp. 48-49. Ottawa, 1891.

places barely went farther back than the line of the old Dundas Street, or "Danforth Road".*

The occupation of these vacant concessions took place at the same time as the settlement of the Otonabee region in 1818-1835, and the fact that the approaches to the region led through an almost unsettled stretch of country was of great importance to the first settlers, and affected life in the area during the first ten years of settlement.

(a) Absentee Grants

Large grants to non-residents were comparatively rare in the Otonabee region. By 1818, Government policy in regard to land granting had become much firmer than it had been in 1798. It had become more and more the practice to limit "grants in addition" in townships where rapid settlement was desired. The idea that grantees receiving hundreds or thousands of acres would be willing, or able, to find settlers for them, had been entirely exploded.

Although locations had still to be found to satisfy the steadily diminishing number of old Loyalist or military claims to large grants, as well as the new crop of recent claims to military grants, these were either distributed among several widely separated townships or located in remote areas where settlement was only beginning. To allow the location of 2,000 or more acres in one township by one claimant had become even rarer than before 1800. In townships surveyed after 1792, the "chequered plan" for locating the Crown and Clergy Reserves made it impossible for one grant to include more than three consecutive 200-acre lots in any one concession, and even these 600-acre blocks were becoming exceptional after 1815.

* Highway No. 2 as far as Welcome and beyond, through Dale and Precious Corners to beyond Grafton, opened as Dundas Street by Asa Danforth in 1799-1800. In Clarke, this highway ran through the "nine-mile woods", where settlement was only beginning in 1816.

The normal basic grant to settlers after 1792 was 200 acres, or one lot. The Lieutenant-Governor could, on discretion, grant 1,000 acres "in addition" to settlers "with the means to improve". Larger grants to unprivileged applicants were always exceptional, and became rare after 1804. To obtain further lands "in addition", a settler had to belong to a "privileged" group, to be a Loyalist or a military claimant, or to have been a Legislative Councillor or a higher government official in 1798. There were also the claims of the children of Loyalists to 200 acres on coming of age, or on marriage in the case of the daughters. These claims were numerous in 1815-1820 but they were diminishing by 1825. However, as late as 1841, there was still a good deal of unlocated, privileged "scrip". In the 1830's, and in the Otonabee region, a common method of procuring a desired location was to buy "scrip" from a privileged claimant (usually a Loyalist) and to have the chosen holding located in his or her name.

The manipulation of "scrip" was a practice of rather doubtful legality, but it was permitted in the case of old claims because most purchasers intended to become actual settlers in the vicinity of the holding. In such cases the purchaser assumed responsibility for the settlement duties, and this was often the case when the unimproved holding had already been patented by the original "nominee".

(b) Fees and Settlement Duties

Until 1829-30, land in Upper Canada was granted under a system of "free grants" on payment of fees. These fees, to which the cost of survey was added, amounted at first to a very low, but hardly nominal, purchase price. They were increased by the Regulations of July, 1804, which remained in force until January 1, 1819. Loyalists, military claimants, and certain privileged classes of settler paid no fees. The ordinary settler's grant of 200 acres was, by the Regulations

of 1804, subject to fees of £6 19s. 4d., plus £1 4s. 1d. sterling, or about \$41 in silver. The silver dollar of that period had at least ten times the purchasing power of the Canadian dollar 150 years later, and \$41 silver was a substantial sum, beyond the means of many immigrants on arrival in the province.

For the benefit of poorer applicants the fees on grants of 100 acres or less were retained under the Regulations of January, 1819, while the fees on larger grants were increased, to provide greater revenue to meet the expense involved in land granting and surveys. Under these regulations, a grant of 100 acres incurred fees totalling £5 14s. 1d., while grantees receiving 200 acres paid £16 18s. 8d. However, at the end of the year, the scale was again altered. Absolutely free grants of 50 acres were provided for "indigent" settlers, grants of 100 acres paid £12 sterling (almost \$60) and grants of 200 acres, £30 sterling.

The new system proved very unpopular. Few settlers of means were ready to be labelled as indigent in order to obtain a free grant. In most cases they wished to take 100-200 acres at the old rate and pay the fees in instalments as had been customary. The Government was accused of selling wild land at a substantial price under cover of "free grants". As a result of public clamour, the scale of January, 1819, was restored in 1824 and the 50-acre free grants abolished. This scale remained in force until the whole system of "free grants" and fees was done away with in 1827. After 1824, absolutely free grants were made only to special groups of settlers, such as the Irish immigrants in this area; or in special areas, usually along "settlement roads".

Settlement duties in 1804 were very much the same as those introduced in 1798. The settler was required to build a house at least 16 feet x 20 feet "in the clear" (inside measurement), to clear, fence, and plant five acres,

and to clear half the road allowance (a strip 33 feet wide) in front of his holding, burning the logs. About 1806, an obligation to cut down all the trees within 100 feet of the centre of the road allowance was introduced, and by 1819 had been made to apply to all grants. The strip of 67 feet was allowed to count as part of the five acres to be cleared, and the requirements as to fencing and cropping were relaxed. These duties were to be completed within two years, and a residence in the house of one year was required on the location ticket. The duties could be performed by proxy, and the house occupied by a tenant. Only one house was normally required per holding, whatever the acreage, but an attempt was made to enforce a road clearing on all the frontages.

(c) Obtaining a Grant

The first essential step in obtaining a grant was a petition to the Lieutenant-Governor in Council, though in some cases a recommendation was first obtained from a Local Land Board or land agent. If the petition was granted, an Order-in-Council was issued as authority to the Surveyor-General or a local agency to issue a "location ticket" for a particular lot or lots. Sometimes authorization came in the form of a directive from the Lieutenant-Governor's Office; this latter procedure must have been quite frequent in Cavan Township, since the authority for a number of grants is designated on the "Domesday Plan" as "Lt. Gov. Of.". "Warrants" issued in connection with land granting appear to have been warrants of survey, while at this period the Attorney-General had to issue a "fiat" for each grant before it could be described and patented. Consequently, land grants are sometimes recorded by the fiat number, or by the number of the warrant of survey; the two numbers seem generally to have coincided.

The method of apportioning locations varied; sometimes the Surveyor-General or agent selected a lot, entering the applicant's name on his "Domesday Plan" of the

township. When a number of settlers wished to locate at the same time in the same township, lots were often drawn by ballot; in other cases the settler was allowed to visit the area and choose his location. Cases of this choice occur fairly frequently in the Otonabee region, but it is probable that many (perhaps most) settlers took what they were given, or drew without any inspection.

A location ticket was now issued, and the settler could now occupy his holding and begin his duties. The next step was to have his holding confirmed by submitting a certificate, sworn before a magistrate, that settlement duties were performed. The settler was now fairly secure in his possession, and he could sell, assign, or bequeath his holding. If he was not compelled to have the grant described and patented and to pay the fees, a grantee might delay doing so for a long time. This meant that the revenue for the expenses of survey, etc., was irregular and inadequate, not to mention the income of the many officials who received a fee on each patent. To prevent this, Governor Hunter had made applicants produce a receipt for the full fees within three days of the date of the Order-in-Council. The settlers could then delay suing out their patents as long as they wished, but they had little incentive to delay. This period was later extended by the Council to three months, but under pressure from settlers it was abolished in 1818, reintroduced by the Council, again rescinded, and again restored. Finally, in January, 1819, it was ordered that one instalment of fees should be paid on receipt of the location ticket, one on filing the certificate of settlement duty (normally about two years later), and one on obtaining the patent. The time intervening between the last two instalments was again left to the choice of the settler.

The first settlers in the Otonabee region, in the years 1817-1819, had mostly to pay their fees within

three months of getting a grant. They would be less likely to delay patenting than the later settlers who had paid only two-thirds of the fees, but in all periods it was common to put off patenting until a need arose to obtain clear title for a sale or to establish a claim to vote. The desire to vote was a good inducement after 1821 to obtain a patent. Up to that time it was widely believed that the mere possession of a location ticket entitled the holder to vote as a "forty-shilling" freeholder. This matter was decided in March, 1821, as the result of a contested election for Durham County in which a squad of would-be voters from Cavan and Monaghan played the chief part. Apparently these men had not yet received deeds for their holdings although some had probably been two or three years on their holdings.

These first settlers received grants under the regulations of 1804, and some later arrivals may have located grants under Orders-in-Council granted before 1819 and so subject to the old regulations. Some other groups came under the regulations of January, 1819, and a larger number under the new regulations which came in force on January 1, 1820. Some of these settlers may have received 50-acre grants as indigent settlers, but grants of 50 acres are not numerous in this area although grants of 100 acres (half a lot) are common.

(d) The New South Wales System

The proposed "New South Wales System" assisted the Irish immigrants of 1825, who received their land upon special terms. These foreshadowed the arrangements for granting lands to settlers of small means under the "New South Wales" system which was authorized in 1826 and came into operation in the next three or four years. By this system land was to be sold to unprivileged settlers in periodic auction sales held in each District. Advertisements of these

auctions, giving the place, day and hour of the sale and a list of the lots to be sold, were published well in advance. Bidding began with an upset price, intended to represent the current market price of wild land in the District. One quarter of the price was to be paid at the time of sale, the rest in three annual instalments.

Arrangements were made to enable purchasers of lots of 200 acres or less, who could not pay the first instalment, to occupy the land at a quit-rent of 5 per cent per annum, paid in advance. This could be redeemed at any time by paying 20 years purchase. Under certain conditions poor settlers could buy land up to 200 acres between sales at the current price, either by instalments or quit-rent. These were very much the terms promised to the assisted settlers of 1825.

From 1830 on, Crown Land was normally obtained by purchase from the Crown, rather than by "free grant". Even the assisted settlers brought to this area in 1831 were made to sign undertakings to pay for their lots at a low figure of 5s. per acre in instalments over a period of six years. There were still four classes of privileged settlers who were entitled to grants without any payments except for survey: British military and naval officers, retired or on half-pay, military claimants from the war of 1812-15, children of Loyalists and Loyalists or holders of Loyalist scrip. These privileged classes continued to be subject to settlement duties after these had been dropped for purchasers who paid cash for their land.

After the appointment of Peter Robinson as Crown Lands Commissioner in 1827, grants and sales were handled by a special Crown Lands Office, the various officials formerly entitled to fees being compensated by regular payments. Local Crown Land Agents were appointed and the business of obtaining a grant and a patent became much simpler. After

the Union of 1841, the methods of land-granting were gradually altered; but before any major changes were introduced, most of the unreserved lots in this area had passed into private ownership.

(e) The Reserves

Under The Canada Act of 1791, one-seventh of the lands purchased from the Indians was to be reserved for the Crown and one-seventh to support a Protestant Clergy. These reserves could only be occupied by lease until the sale of some should be specially ordered. By the "chequered plan" the reserved lots were scattered through each concession in such a way that every third or fourth lot was reserved and no two reserved lots had a common boundary. Leases were for ten years, with an option of renewal, and could be devised, assigned or sublet during the term of the lease.

Some of the reasons for setting up the reserves were sound and they served some useful purposes. But the system was badly managed; revenue from leases was disappointingly small; settlement duties, particularly road work, were badly enforced and there was constant trouble from squatters. Besides, the whole system suffered from the odium engendered by bitter disputes over the disposal of revenue from the Clergy Reserves. By the time this area began to be settled, the authorities were already looking for a way to be rid of the whole body of the reserves.

Only a very limited number of Crown reserves had been sold before 1825, mostly to occupants. The unsold remainder in the surveyed townships were disposed of in 1826. The great majority of Crown reserves were sold to the Canada Company, a considerable number were granted to King's College (later the University of Toronto) and the rest sold to such tenants as were willing to buy at the price fixed. It was hoped to sell most of the Clergy Reserves to the Canada Company, but this scheme was unsuccessful and the Clergy Reserves

remained for another twenty years the subject of bitter dispute and of a serious grievance against the Government. However, it was ordered that a certain number of Clergy Reserves should be sold every year. These sales were naturally more numerous in areas where settlement was well begun. The Canada Company was also eager to dispose of Crown Reserves as quickly as possible. It had purchased a huge area (the Huron Tract), offered to it in lieu of the Clergy Reserves, and the Crown Reserves scattered through the settled townships were its best source of immediate revenue. Most of the reserves had been sold to private individuals by 1860, though the Canada Company was still holding lots in remote or unattractive areas in the last quarter of the nineteenth century.

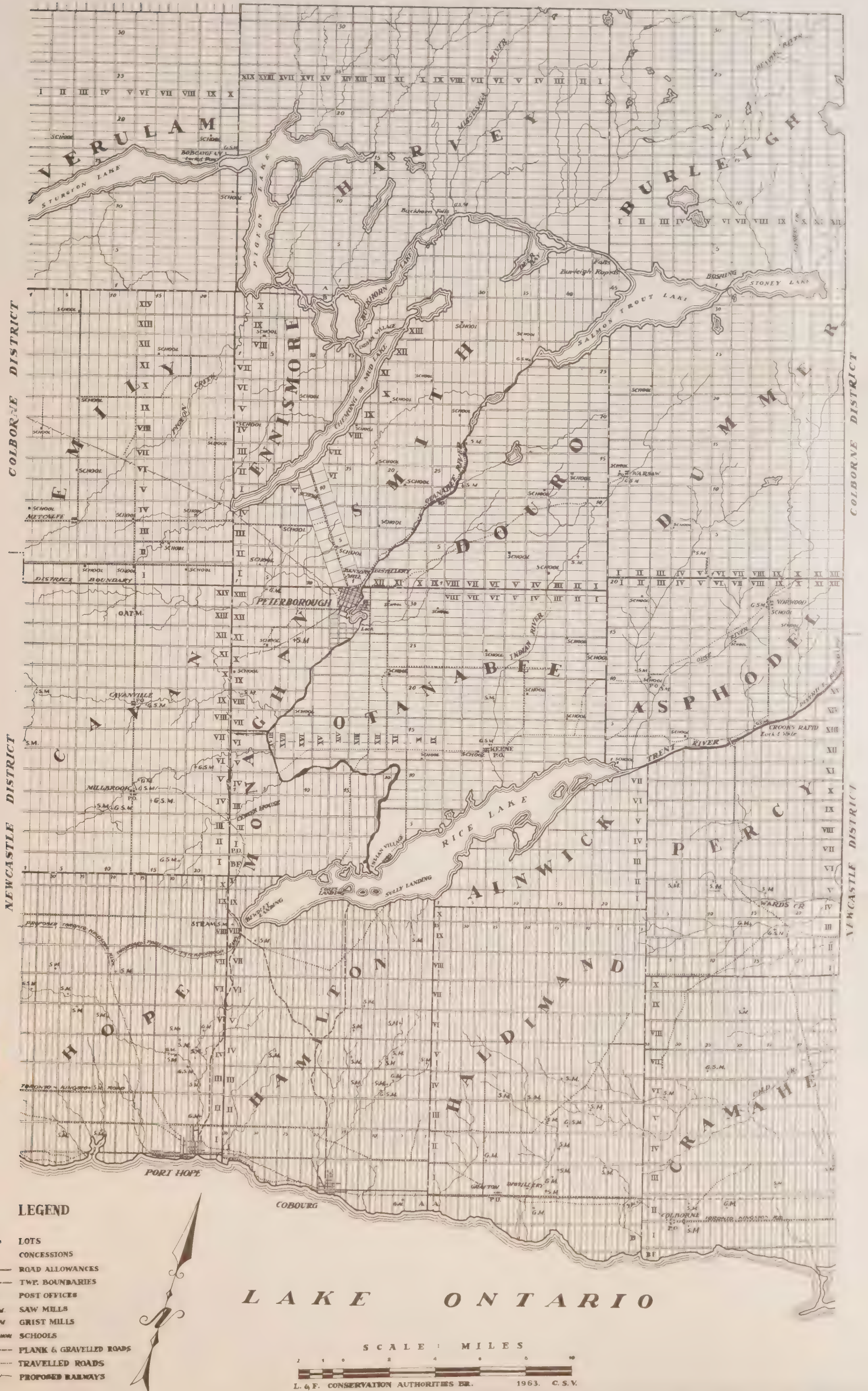
THE OTONABEE REGION IN 1848.

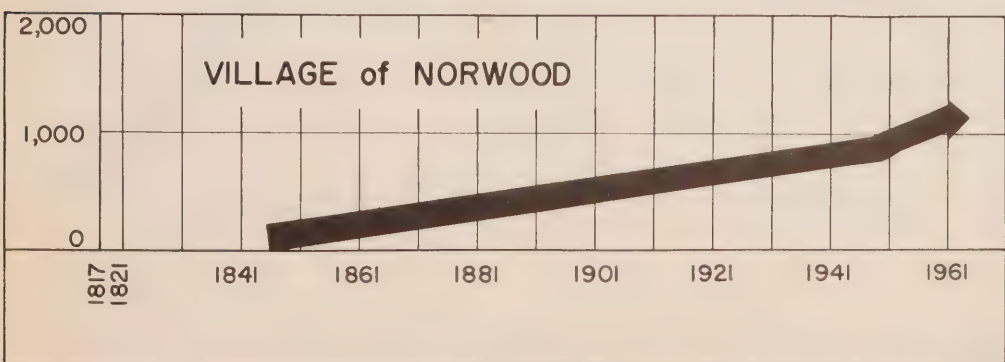
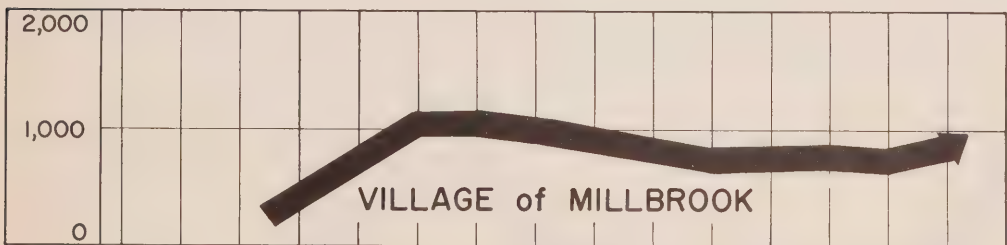
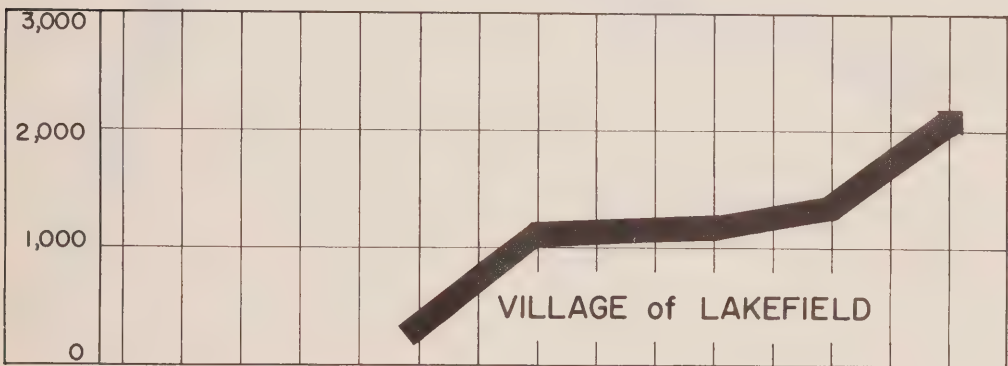
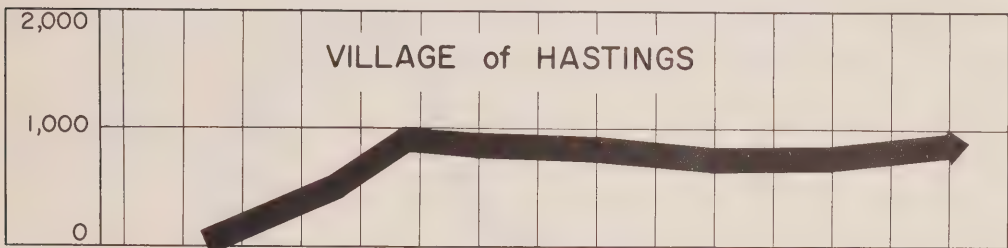
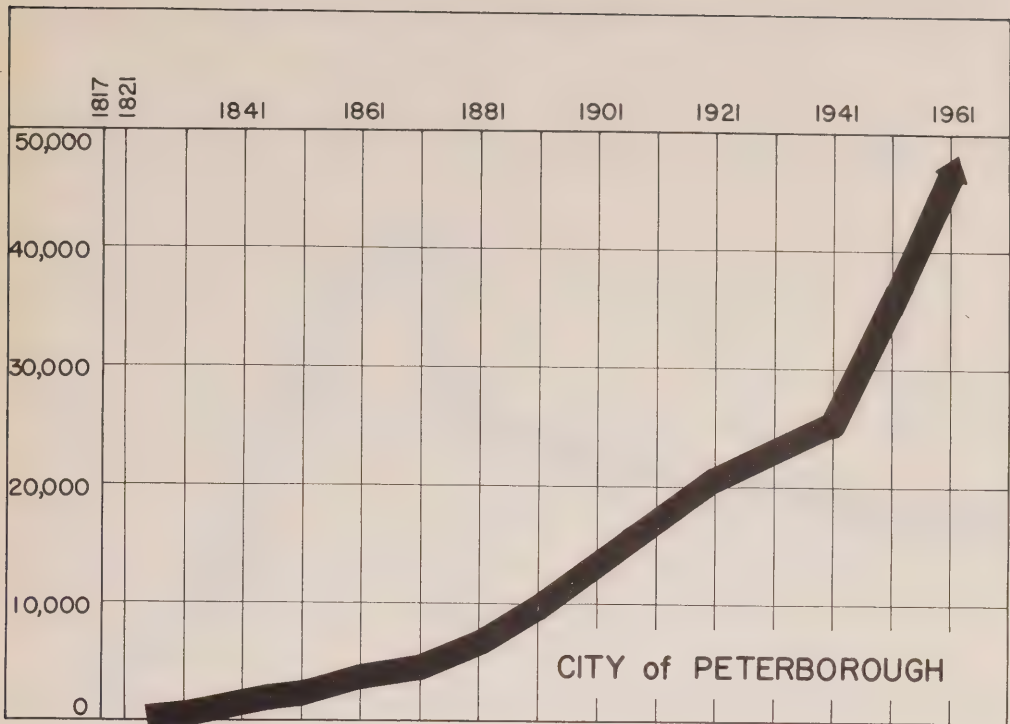
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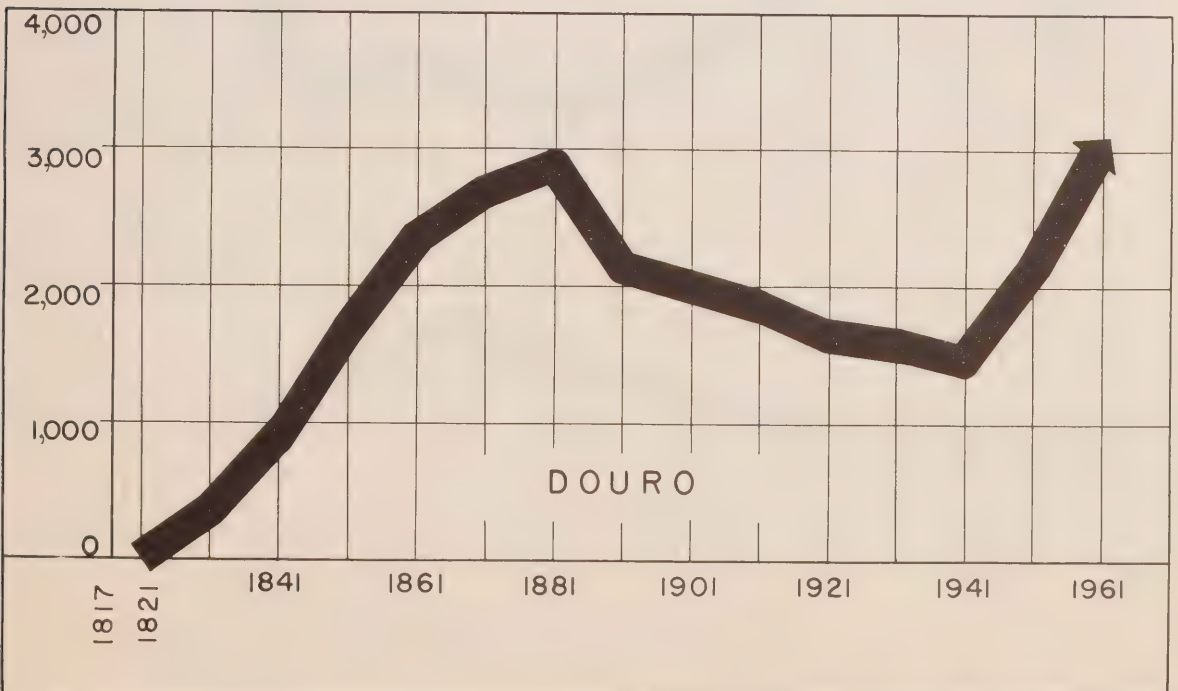
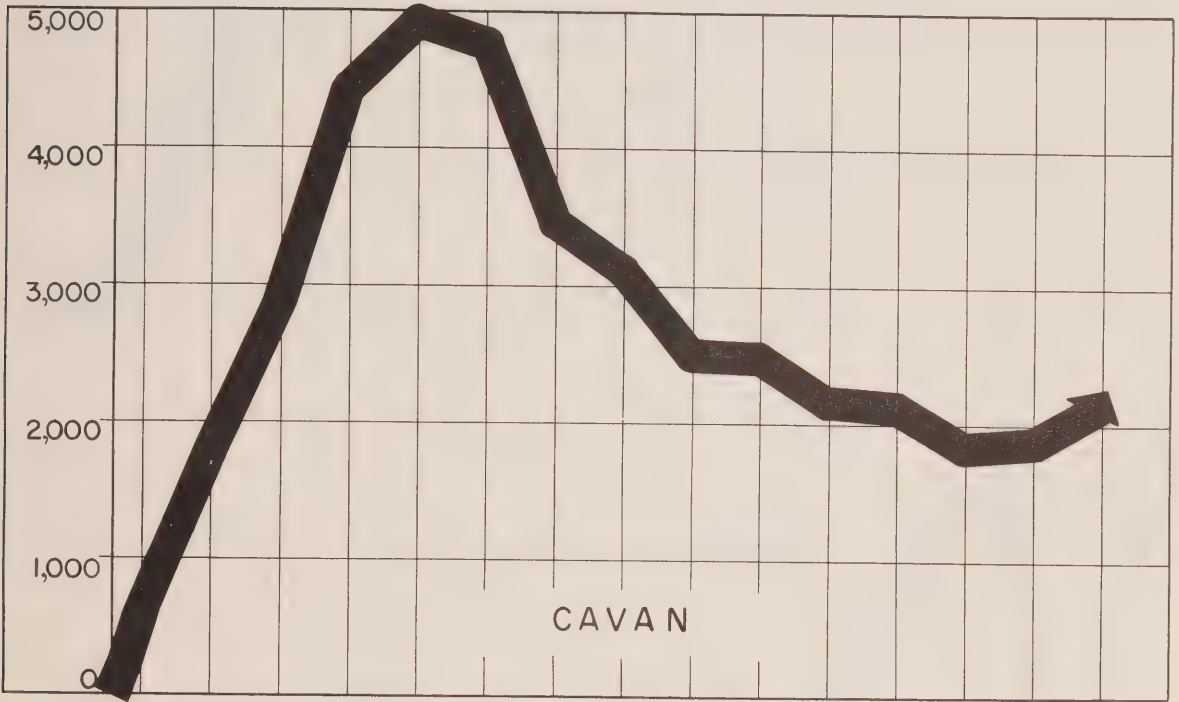
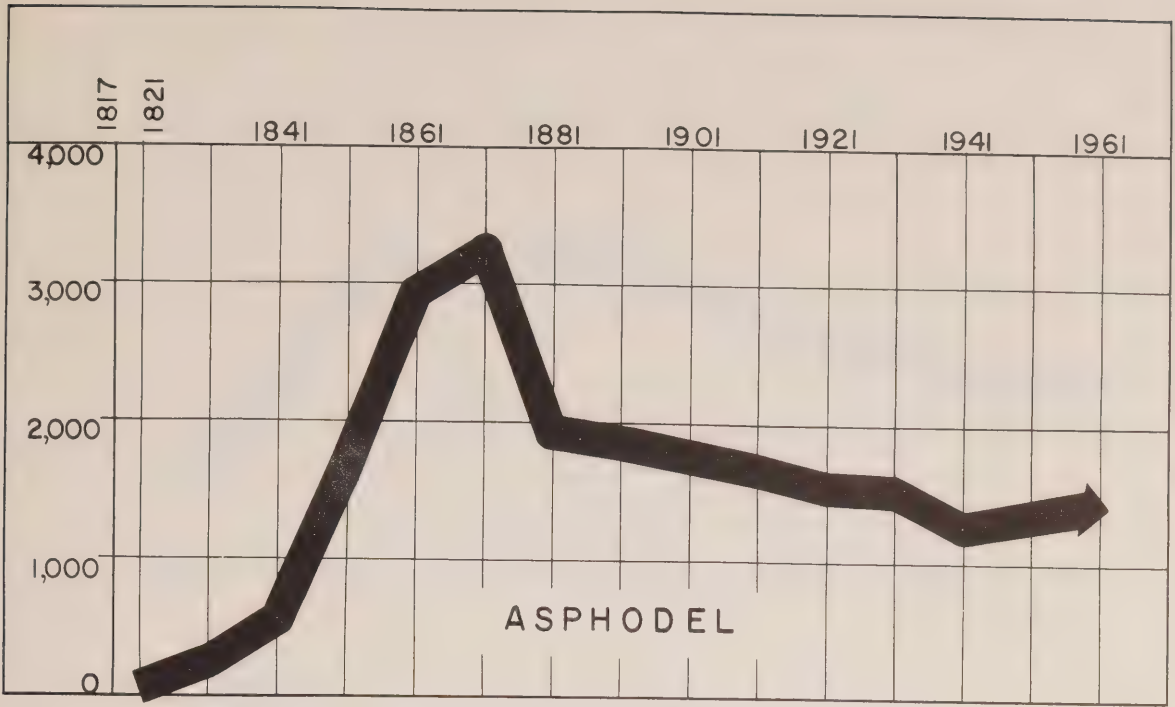
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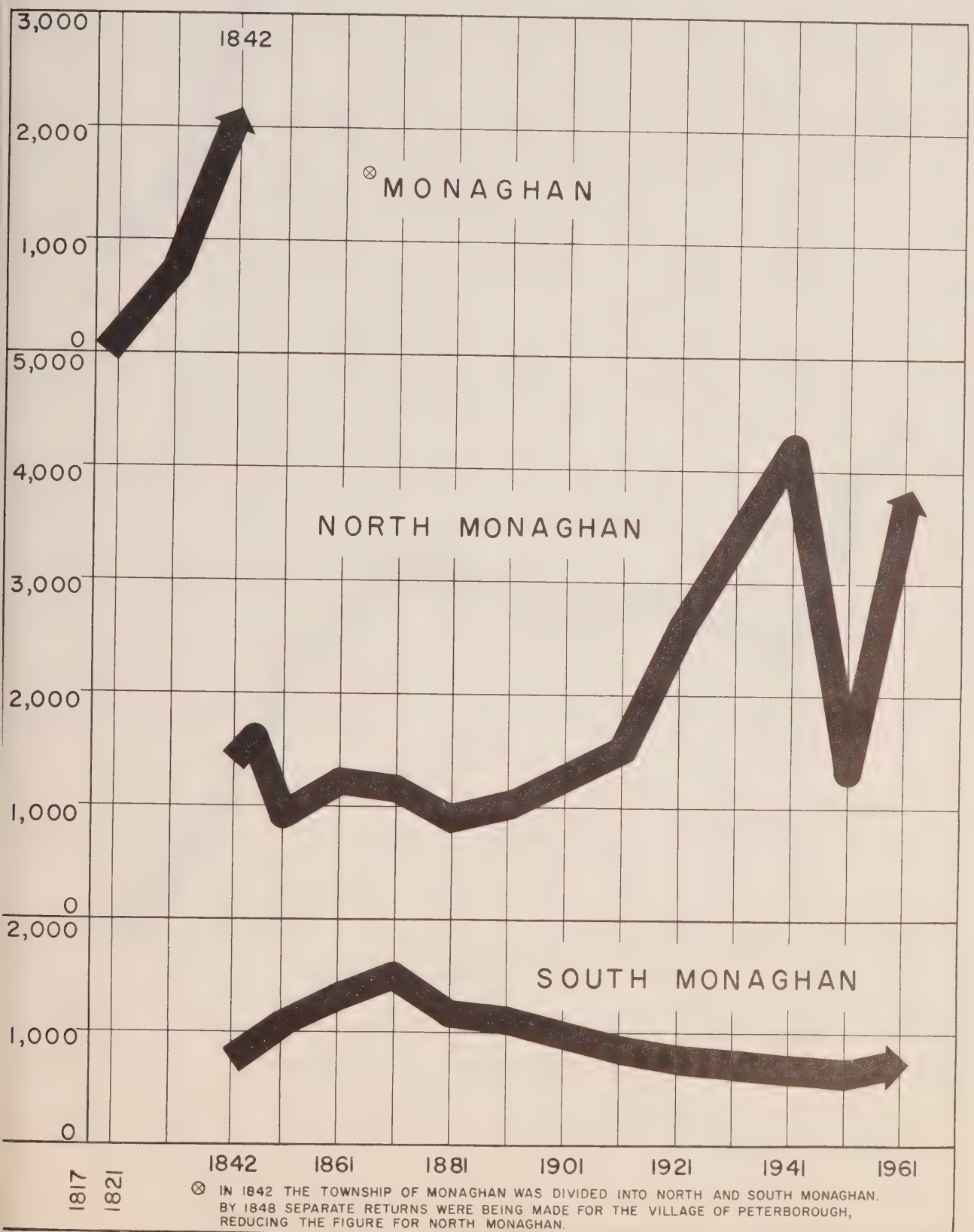
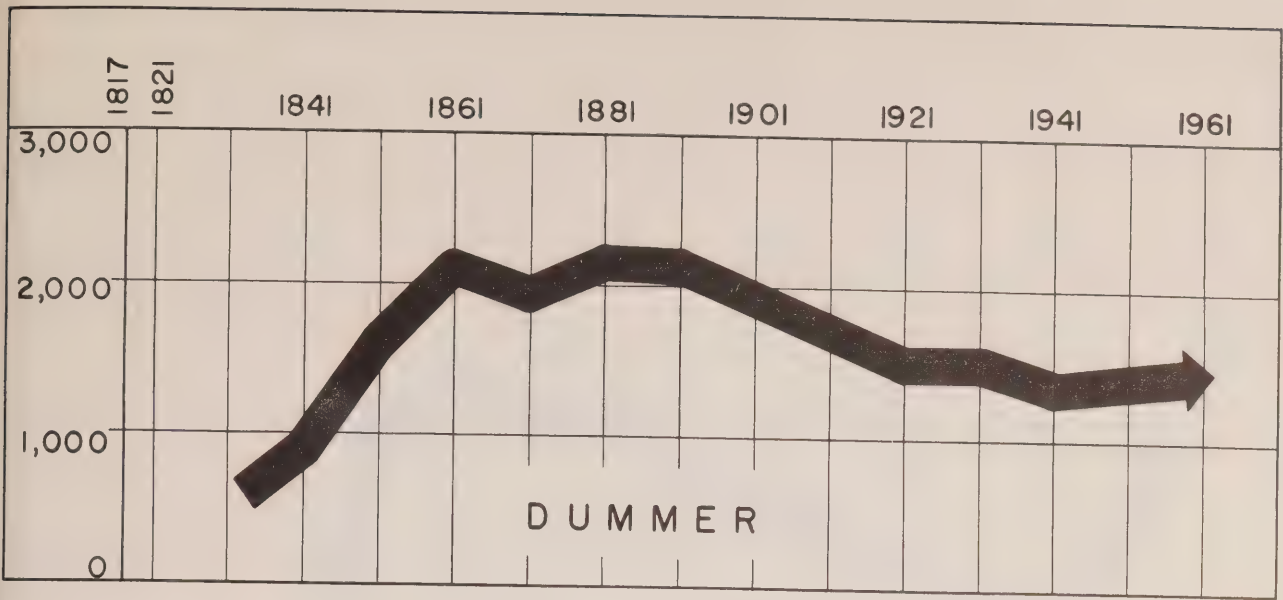
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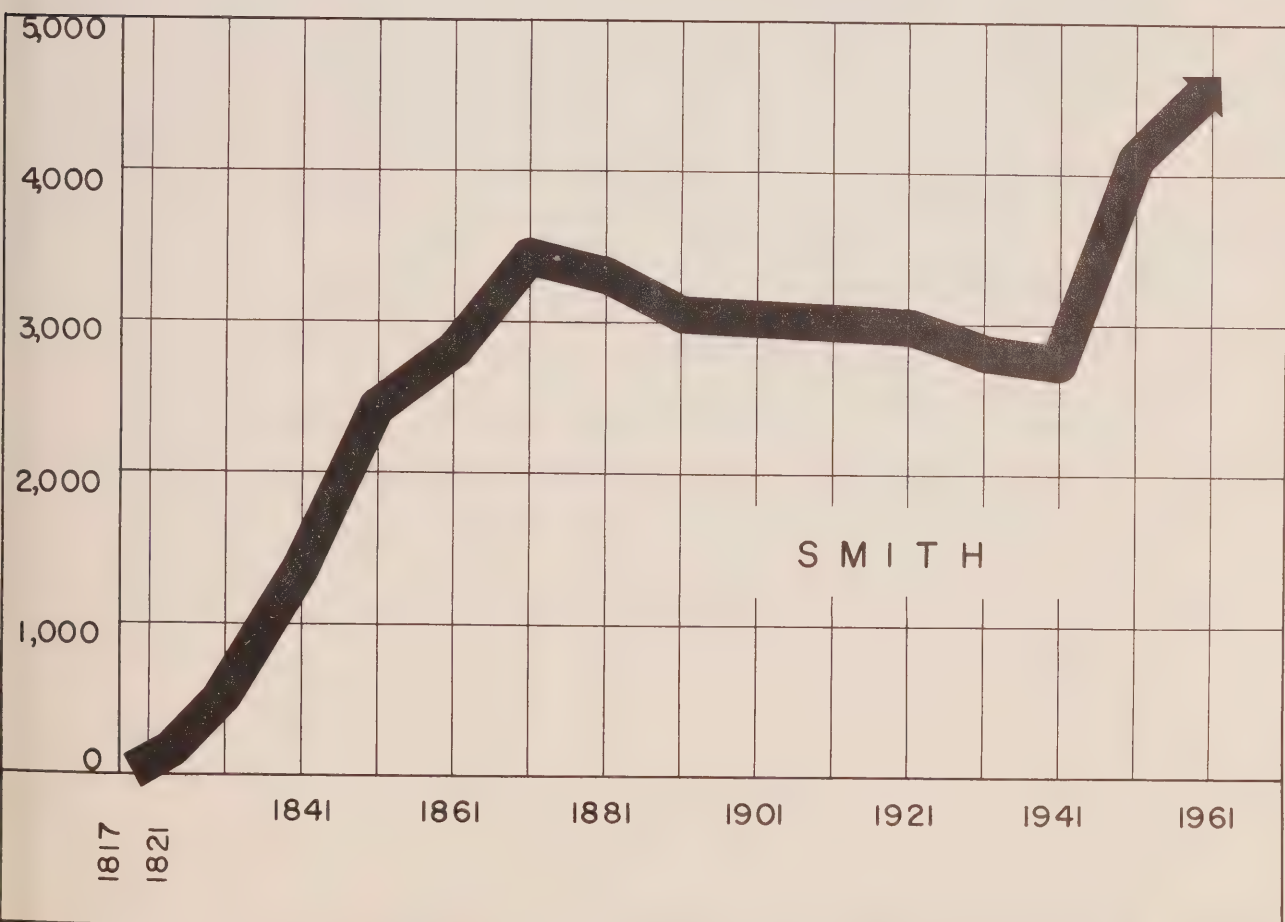
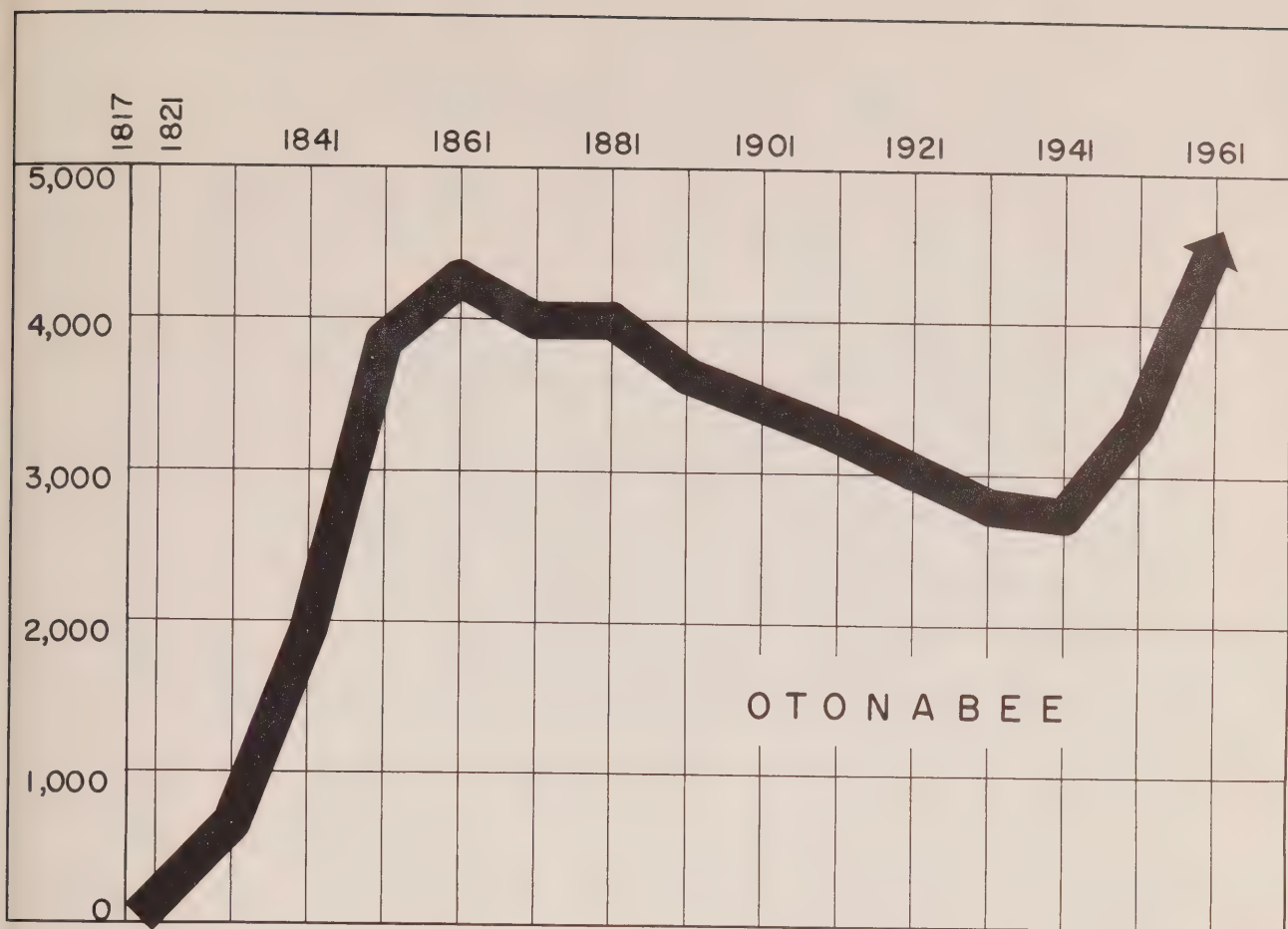
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TOWNSHIP POPULATION

CHAPTER 3

EARLY INDUSTRY, 1820 - 1858

1. Early Grist Mills

The establishment of a grist mill was one of the first objectives of the pioneers; a saw mill was desirable but not so essential to a minimum of comfort. In the absence of mills, the pioneer settlers had recourse to a variety of substitutes, such as coffee-mills, and the "hominy-block", the crude mortar and pestle used by the Indians. These contrivances were not wholly abandoned after a mill had been built, for there were frequent stoppages of the crude mills, and storms might make travelling impossible for long periods.

Dr. Poole tells the usual story of long treks on foot to the nearest mill with a bag of grain, and the return with flour. In the years between 1817 and 1820, such trips must have occurred fairly frequently. The nearest mill before 1819 was at Smith's Creek (Port Hope), and the distance was little shortened by the building of Jacob Choate's mills in 1819 and Jeremiah Britton's near Quay's crossing in 1820. According to Poole, it was the practice to take potatoes along as provision, caching some on the way to eat on the return trip. As every pound of potatoes carried would mean one less pound of grist, the amount of this provision must have been small. The opening of the Cavan Road in 1818-19 did something to lessen this hardship, and after 1820, as we shall see, a mill was sometimes available in Cavan Township.

In a letter dated December 12, 1825, Mrs. Stewart mentions that Adam Scott's grist mill had stopped running. When milling facilities were unavailable for any length of time, settlers had to return to the old methods of obtaining flour. In the words of Mrs. Stewart:

"...we must again grind the wheat by hand-mill;
it is winnowed by sifting in the wind. The
bread is coarse and black..."*

Such lapses in milling service were sure to be keenly felt by the local settlers, for whom the establishment of a grist mill was a major convenience.

(a) Cavan Township

The earliest grist mills in Cavan Township were probably erected by about the year 1820. In any case they were certainly in operation by 1821, since they were both assessed in the following year. One of these mills was built by James Galloway on "Galloway's Creek" (now "Baxter Creek"), Lot 10, Concession III, south-west of Millbrook. The other, also powered by Baxter Creek, stood on Lot 12, Concession IV, and was assessed to James Deyell in 1822.

Galloway's grist mill was probably slightly earlier than Deyell's, which appears to have been a saw and grist mill. Poole dismisses the former, somewhat cavalierly, as a mere "apology for a mill", and tells of the discomfiture of one settler from Smith Township, who at the onset of winter teamed his wheat to "Galloway's Creek", since his family had been without flour for a fortnight. The man found the mill deserted and the mill-wheel frozen fast, and spent the better part of the night chopping it free of ice and debris. However, to his dismay, "a few rounds was the utmost the machine could be urged to go, and he had to trudge back weary and disappointed".†

* Dunlop, Mrs. E.S., Ed. Our Forest Home, p. 86. In another passage, Mrs. Stewart makes clear that the "hand-mill" was a coffee-mill. The story of workmen daily grinding meal for the household has a parallel from the Long Point Area in 1795.

† Poole, Settlement of Peterborough, p. 126.

As we have already noted, the grist mill on the Millbrook site was assessed to James Deyell, and it remained in his possession at least as late as 1851. John Deyell, brother to James, when interviewed for an historical atlas in his old age, said that he had built the "first grist and sawmill" in Cavan, and that he had had a stonecutter dress down a large boulder into millstones. It is probable, then, that John Deyell served as millwright to his brother, at least during the early years of the mill, although he appears to have lived on his own holding, Lot 23, Concession III.*

These remained the only grist mills in Cavan until 1825-26. In the roll for 1825, Francis Taggart is assessed with a sawmill on Lot 14, Concession VIII, so his first dam was evidently finished in 1824-25. His grist mill was built and running when the roll was prepared for 1826. "Taggart's Mills" are mentioned in connection with the possible navigation of Cavan Creek in 1833† and it remained "Taggart's" until after 1851; in the next ten years it was sold to William Lough and was being operated by William Lough, Jr., in 1861-69. It again changed hands in 1870 and, under several different owners and millers, lasted well into this century, though the water-power appears to have been disused before 1829 and the mill moved to a site west of the old one.**

One of the mills in Cavan was given a second run of stones in 1834-35 and a fourth grist mill was in operation by the beginning of 1836. This was the Best mill on

* Illustrated Historical Atlas for Northumberland and Durham, 1878, pp. vi-vii. There may be some misunderstanding of what Mr. Deyell actually said. The boulder was probably granite, a stone often used for millstones.

† The Valley of the Trent.

** The topographical map shows a grist mill on Lot 13, but shows the former pond as a swamp.

Lot 15, Concession XIV, near Mount Pleasant. Thomas Best had built a sawmill on this site in 1830-31. These mills are said to have been in continuous operation until 1884, when both were destroyed by fire. They were rebuilt, but destroyed again by a flash flood in 1911 and rebuilt three years later. Hiram Best, grandson of the first Thomas Best, operated both grist and sawmill until a short time ago and still owns the pond and surviving buildings, possibly a record for continuous ownership of a millsite in Cavan Township, or even in a wider area.

Four grist mills are the largest number returned for Cavan Township until 1845, when the total suddenly increases to seven and remains at this figure in the next two returns, 1846 and 1847. Sandford Fleming shows seven grist mills in the township in 1848, with an "oat mill" near Mount Pleasant, evidently the "oat and barley mill" owned by Samuel Best a few years later. He omits the Thomas Best saw-and-grist mill, so four new grist mills may have been built in 1844. However, two grist mills shown by Fleming, if they ever existed, were short-lived. One on Squirrel Creek (Lot 17, Concession I) appears only as a sawmill on Tremaine's map of Durham County in 1861 and another, on Lot 17, Concession VI, had become Hetherington's chair factory by 1851 and continued to be a chair factory until the sixties.

The other new mills were both on Baxter Creek; one on Lot 13, Concession V, close to Millbrook and the other one on Lot 20, Concession VI. The first, with several changes of ownership, lasted until the end of the century. The second had come into the possession of Water (or Walker) Weedler when Tremaine made his map in 1861. It is shown as the "Cavan Mills". The property had been sold to William Reynolds by 1878, the Weedlers having acquired the Deyell mills at Millbrook by 1869.

No new grist mills seem to have been built in Cavan in 1847-51. In fact only four were returned in 1850 and in the census of 1851-52. The latter were all water mills. One of these mills seems to have been grinding 4,000 barrels of flour a year, a fairly large quantity compared to other returns for this area. These returns may be incomplete, for five of the seven grist mills shown by Fleming were grinding in 1861, and the Best mill on Lot 15, Concession XIV, was also in operation at that date. Another Best flour mill was added to the saw and oat mills at Mount Pleasant by 1871, and there may have been a grist mill on the Ivory site at Cavanville at that time. The Mount Pleasant grist mill lasted until 1932 or somewhat later. This would bring the total to eight grist mills, probably the highest number in Cavan Township, for part of the 1880's.

(b) Monaghan Township

The first mill in Monaghan, and perhaps the best-known in the whole Otonabee region, was the one erected by Adam Scott in connection with the proposed Town Site on the Otonabee that was later to become Peterborough. The mill seat at what was later to be known as "Scott's Plains" was originally among the numerous interests of the Hon. Charles Fothergill of Port Hope. Fothergill had received lots on the "Street of Communication" as early as 1817, and he quite probably visited the Otonabee region, either at the time of the grant or during the following year. On February 11, 1819, an Order-in-Council was issued in favour of Fothergill's petition, to the effect that:

"...so much of the Order in Council Reserving Lots No. 13 & 14 in the 13th Con. of Monaghan for the scite /sic/ of a Town & be reserved /so/ as to admit a Lease a Mill Seat & 10 Acres of Land adjacent at the choice of Petitioner to be Leased to him for Ninety Nine Years."*

* Ontario Department of Lands and Forests: Survey Records. Order-in-Council Book, Vol. IV, p. 439.

On the following day, February 12, the Surveyor-General, Thomas Ridout, informed Samuel S. Wilmot of this Order-in-Council and requested that he survey the property selected by Charles Fothergill, who would defray any expenses incurred. "Mr. Fothergill's Mill Wright", presumably Adam Scott, was to accompany the surveyor in order to point out the situation. Wilmot, however, declined this extra task, pleading the press of uncompleted work, and Fothergill seems ultimately to have had to rely upon the services of John Farrelly, an unlicensed surveyor.

Shortly thereafter, according to Dr. Poole, Charles Fothergill decided to make a personal inspection of his prospective mill seat. In the month of May, 1819, he ascended the Otonabee with Scott, Farrelly, and three others: "Thomas Ward, Esq. of Port Hope, Clerk of the Peace for the District,...Barnabas Bletcher", and "Mr. John Edmison,... an intending settler" in Smith Township. Edmison and Ward apparently went off to inspect their own grants, while the others stayed on the present site of Peterborough, "prospecting" for the best possible mill seat. Adam Scott soon decided that,

"...By damming up the creek /Jackson's Creek/ which still traverses the site of the Town, and conveying the water along a short excavation to the steep bank of the Otonabee river, an eligible mill-site would be obtained, and at a trifling cost compared with the expense of attempting to control the rapidly descending waters of the Otonabee, at any point in the neighbourhood".*

After their separate tour of inspection, Edmison and Ward rejoined the main group, and the whole party returned to "the front".

We find Adam Scott assessed in 1822 for a grist mill, which may have commenced operations during the

* Poole, Settlement of Peterborough, p. 2. "Farrelly" or Farley was the surveyor.

previous year. We possess further evidence indicating that Charles Fothergill had relinquished his interest in the Jackson's Creek mill seat to Scott, in a letter written from Asphodel, October 23, 1822, by Richard Birdsall to the Surveyor-General's Office. After discussing the Survey of Douro, Birdsall says that he had

"...examined the Situation of the Mill Reservation in Monaghan (as you Desired Me) and Made a Survey of the same as the person (who purchased the lease from Mr. Fothergill) and built the Mills is Desirous of obtaining a lease of the said reservation and understanding from Mr. Fothergill that there was some difficulty in obtaining the lease on account of the Survey he wished me to make a Survey of it and enclose it to you he gives me a certificate that what I surveyed is all that is necessary for the use of the Mills etc he is the bearer of this and can give you any information on respecting it I have taken the liberty of enclosing a Rough plan of the Said reservation (with his certificate) to you and beg leave to make a few remarks on it."*

Birdsall's "remarks" consisted of a suggestion that two main streets be laid out in the proposed Town Site. It would appear, however, that the exact extent of the original grant of ten acres in the Town Plot in Monaghan was not clarified until January 8, 1823, when it was decided officially that:

"...the selection of 25 chains along the bank of the River is not properly within the view of the Order of 11 February, 1819..."†

Dr. Poole seems inclined to damn the early mills in the Otonabee region with faint praise, but his description of Adam Scott's pioneer establishment is particularly uncomplimentary:

"During the four or five years preceding 1825, the little mill erected by Mr. Adam Scott on the bank of the Otonabee, (corner of King and Water streets,) had been in operation. It was a frame structure of about 18 by 24 feet, and shook under the vibration of the machinery. Within this small space was fitted up a run of very common mill stones,

* Ontario Department of Lands and Forests: Survey Records. Surveyor's Letters, Vol. X, No. 20.

† Order-in-Council Book, Vol. VI, p. 156.

and a single upright saw. Without wishing to disparage the enterprise which established this poor apology for a mill, in the heart of the wilderness, it must still be confessed, that neither in gristing or sawing, was it adequate to supply even the limited requirements of the few early settlers of the period..."*

Mrs. Dunlop, in editing her mother Mrs. Stewart's correspondence, echoes Poole's criticism of Scott's mill, and adds that the flour ground there was "black and wet, as there was no apparatus to clean the wheat and the machinery was for ever breaking down".

Pioneer tradition and literature contain several references to settlers bringing mill-irons, machinery, and even millstones into the country. Not many millstones can have been brought by Loyalists and other immigrants, however, since, as we have seen in the case of Deyell's mill, these were generally available locally. Machinery was quite another matter, as a rather incredible anecdote concerning Adam Scott, which appears with variations of detail in several printed sources, illustrates. C. Pelham Mulvany, in his History of Peterborough, a continuation and enlargement of Poole's work, attributes the story to Thomas Choate, the first settler at Warsaw. At any rate, Choate appears to have told Mulvany that Adam Smith, faced with one of the frequent breakdowns to which his little mill seems to have been subject, carried the heavy mill crank on his shoulders to Port Hope for repairs, and returned triumphantly to restore his establishment to service. The journey to and from Port Hope took several days, the March snows were still on the ground, and, according to one account, the crank weighed 250 lbs.†

* Poole, Settlement of Peterborough, p. 14.

† Mulvany, C. Pelham. History of the County of Peterborough, Ontario, p. 250. Toronto, 1884.
Weaver, Emily P. The Story of the Counties of Ontario, p. 28. Toronto, 1913.

Despite Adam Scott's valiant efforts, his small mill was inadequate for the needs of the settlers. It last appears in the official Assessment Returns for the year 1826. Thereafter, the mill site remained unused for some years. An indignant letter signed "C.K.", in the Cobourg Star for October 9, 1833, described the stagnant pond as an "intolerable nuisance...a great eyesore, and little conducive to the health of the inhabitants", and hoped that the dam might soon be removed.* However, Major Hamilton came to Peterborough in 1833 and, in partnership with a son-in-law, Mr. Fortye, purchased the idle mill. By the following year, the new owners had made extensive improvements including the addition of a brewery and distillery.

Unfortunately, during the summer of 1835, a sudden fire wiped out the entire establishment "in three quarters of an hour". The mill and distillery were rebuilt without delay, but Major Hamilton suffered a severe paralytic stroke that same autumn.† The new buildings were commonly called "Fortye's Mill" during the early 1840's, but by the spring of 1845, if not earlier, they had been leased to Thomas Benson. Thomas Benson had been Paymaster of the 3rd Battalion of Incorporated Militia from 1838 to 1842, and was later to become the first Mayor of Peterborough, where he settled in 1843. One of his letter books, recently discovered, contains among other items of interest a most illuminating series of business letters, written between 1845 and 1851 and pertaining to his milling interest in Peterborough and its vicinity.

Benson began his venture in milling at an unfortunate time. Tariffs on flour imported into Great

* Guillet, Valley of the Trent, p. 359.

† Langston, John. Pioneer Days in Upper Canada, pp. 128, 142, 146. Toronto, 1926. Also Poole, p. 14.

Britain had in 1842-46 given a preference to the product of colonial mills. This made it profitable for Canadian millers to grind wheat imported from the United States for export to Britain, as well as a large part of the local crop. This preference ended with the repeal of the Corn Laws in 1846, and by the end of 1847 many millers in Canada West were feeling the pinch, Thomas Benson among the rest, as these letters show.

Benson appears to have done a good deal of custom grinding for local merchants or agents with connections at Montreal. The first letter of the above-mentioned series, written April 11, 1845, to James Hall, a Peterborough merchant and grain dealer, offers contract conditions for the flouring of the latter's "lot of Wheat, say five thousand Bushels". Thomas Benson seems to have been making some improvements on the mill, since he estimated that it should be ready to go into operation "about the 1st of May". He also stated emphatically that he would grind Hall's wheat "exclusively until it shall be finished", further engaging

"...to have one thousand Barrels of your flour ready for shipment (provided you furnish me with sufficient wheat to make that quantity) within the month of May next, and will deliver the flour in good condition free of charges for Carriage, on the steam Boat wharf in Peterboro'".

In addition, Benson agreed to compensate Hall, upon the latter's producing the usual vouchers, for any flour that failed to pass inspection as "Fine". Finally, the flour would be packed in "seasoned barrels of the first quality, well coopered and neatly branded". Hall was to signify his acceptance of these terms within an unspecified number of days, and the "Customary reservation in case of loss by fire, flood, or tempest" was to be observed.

Hall appears to have found the service at "Benson's Mills" satisfactory, since Benson wrote him again on July 21 of the same year, regarding the shipment of 91

barrels of flour to Montreal aboard the steamer Forrester. Forty-one of those barrels were branded "Colborne Mills" and marked with a "H"; of this lot, Benson admitted that it was "an inferior article and must be allowed to go for what it is worth". However, Thomas Benson was exceedingly sanguine concerning the other fifty barrels, which were marked "T.B.T.H." and branded "Benson's Mills" "Manufactured from Siberian Wheat", and which he clearly considered a superior lot, that

"...may be placed as a fair sample of wheat my Mills will in future turn out uniformly, under that brand. It will, I think, be found on account of its strength and other good qualities, to be a favourite article with the Montreal Bakers if tried by them...I am desirous and determined to make this brand a favourite."

Benson would appear from this to have been keenly aware of the advantages afforded by the widespread introduction of Siberian and other hard varieties of wheat.*

Another letter, dated "Benson's Mills, Peterboro 19th July 1845", contains Thomas Benson's conditional acceptance of a cooperage contract tendered by Thomas Sheerin of Emily Township. Sheerin had offered to supply "one thousand Flour Barrels to be made of well seasoned stuff, and finished in the best manner, of Red Oak Staves and heading". Benson agreed to pay one half the current cash price on delivery of each lot of barrels. The final deadline for delivery, on which payment in full was also to be made, was to be April 1, 1846.

After 1845, there is a gap in the correspondence contained in Thomas Benson's letter book, and the next letter is dated January 13, 1851. It is addressed to "Messrs. W. & R. Muir, Montreal and Wm. Clinton, Esqre. Peterboro'" and contains the specifications for a proposed flouring contract similar to the one with James Hall. Benson proposed

* At this time various pests were affecting the quality of much Canadian wheat.

to receive "any quantity of Wheat, up to ten thousand bushels, you may deliver at my Mills in this town". By this time he seems to have been milling two brands, "Peterboro' Mills, Superfine", and "Aubrey Mills, Superfine". At any rate, he confidently asserted:

"...I will guarantee both brands to pass inspection in Montreal as Superfine, the Peterboro Mills as number one. The flour to be packed in Strong, well-seasoned barrels, sufficiently coopered and line-hooped, ready for shipment, and delivered on board the Steam-boat or in any Store house in Peterboro', free of expense to you."

On August 13 Thomas Benson paid fifteen dollars on a policy with the St. Lawrence County Mutual Insurance Company of Ogdensburg, New York. This letter was posted, and the enclosure certified by his son, Thomas Moore Benson. Finally, on August 23, 1851, Thomas Benson wrote the following letter to "Messrs. E. Perry & Co., Cobourg":

"Gentlemen,

"I beg to inform you that Mr. James R. Benson has taken possession of the Mills, I had a lease of, and has assigned his interest in the property to Mr. Wallis, on the condition that you should be allowed to take the Mills under my lease on paying the amount of his claim to Mr. Wallis and the arrears of rent, amounting together to £525. if you should think proper to do so, as a means to pay yourselves the amount I owe you."*

By this complicated transaction, the lease to the former "Fortye Mill" passed to James Wallis, who is listed as its owner in 1858, with E. Peplow (later proprietor of the "Viaduct Mills" at Port Hope) lessee. At that date, the mill had "three run of stones, manufacturing 75 barrels a day". By 1896, however, the mill pond seems to have disappeared, and the site of the mill building was occupied by one of Peterborough's two canoe factories.

* James Rea Benson was another brother, a merchant and mill owner of St. Catherines, C.W. He was later a Senator of the Dominion of Canada.



This building, which was formerly the flour mill at Warsaw, dates from 1835-50.



The mill at Westwood was probably built about 1850.

About the year 1827, another grist mill was erected, under Government auspices, on the "Town Site in Monaghan", and appears to have operated as a Government mill until about 1829, when it was leased to a private operator, since it figures as a grist mill with a single run of stones in the Assessment Returns of January, 1830. By 1835, the former Government mill was being called "Hall's Mills". N.H. Baird, reporting at that time on the "most eligible route for a Canal between Lake Simcoe and the Rice Lake", describes this mill as standing "above Peterboro' bridge" and deriving its water power from

"...a dam across the river as shewn upon the accompanying detailed plans, having a head and fall of 12-7 8/10 feet. This dam has the effect of sending the water as far back as point A on the plan..."*

By 1858 "Hall's Mill" was under the proprietorship of M. Martin, and would seem to have been reconstructed as a grist mill with three run of stones, "manufacturing 80 barrels a day".

The third grist mill to be assessed in North Monaghan was probably the one shown on Sandford Fleming's Map of 1848, on Jackson's Creek, Lot 5, Concession XIII. Three grist mills were assessed for Monaghan from 1840 to 1847, except for the year 1842, when four were assessed. Smith's Canadian Gazetteer of 1846 gives three grist mills for North Monaghan, two of them in Peterborough.

(c) Smith Township

Jacob Bromwell was granted Lot 18, Concession II, Smith Township, under the Regulations of January 1, 1819, after an earlier grant of the same property, made in 1817 to one William Howard or Howarth, had been rescinded. Bromwell

* Guillet, Valley of the Trent, p. 163. Baird's Map of 1836 has "Hall's /Mills/" on the Smith side above the Town Line, approximately on the site of "Benson's Mills" on Sandford Fleming's Map of 1848.

erected a small grist mill at the mouth of an unnamed creek which, according to Dr. Poole, entered the Otonabee just below Mr. Snyder's saw mill. However, this mill appears only to have operated very briefly in 1826; it was soon superseded by the Government mill at "Peterborough", and it was never formally assessed.

The first grist mill to appear on the Assessment Returns for Smith Township does so in 1833, then disappears until 1836. This was probably Young's Mill at Young's Point; although it actually lies outside the Otonabee region proper, it was so important to local settlement that it must be considered. It may have begun as a temporary establishment as early as 1832; at any rate, it was certainly in operation by 1835, when N.H. Baird described it as follows:

"...Next in order, and the only obstruction to the navigation on the 2nd section, is the rapids at and opposite Young's house and mill, and the artificial obstruction of a dam thrown roughly across the river by Mr. Young, for the use of a very complete common principled grist mill, made to drive two runs of stones, with a total head and fall of only 3 feet, and during the particular period of my inspection, had only 24 inches, and affords an instance of what properly applied power may produce, with a due regard to economy of water. By the accompanying plan it will be seen the enterprising proprietor has spared no pains in the construction of an aqueduct, &c. through a stony stratum to gain his end..."*

Mrs. Moodie, who also saw Young's grist mill in 1835, says that "Mr. Y--" was an Irish Catholic immigrant, "the son of a respectable farmer from the south of Ireland", who had come to Canada a few years previously "with a large family of seven sons and two daughters". Although business had been slow initially, Mrs. Moodie found him "driving a thriving trade, and all the wheat that was grown in the neighbourhood was brought by water to be ground at Y--'s mill".†

* Guillet, Valley of the Trent, p. 164.

† Moodie, Susanna. *Roughing It in the Bush*, p. 324. Toronto, 1923.

The "Mr. Y--" in Mrs. Moodie's account was, of course, Francis Young, who in 1823 had been recommended as an emigrant by the curate of Newport, being described as "a man of most industrious sober habits & great mechanical ingenuity"; he had, accordingly, come to Canada as a "Peter Robinson" immigrant, in the John Barry.^{*} By 1839, however, his sons, Matthew and Patrick, were being assessed for a grist mill and for the Broken Lots 37 and 38, Concession XII. There may have been a later rebuilding of this mill, since Sandford Fleming's Map of 1848 shows "Grist & Saw Mills" on the extreme south-eastern corner of Lot 35, Concession XII. Young's Mill also appears on a map published by W.H. Smith in 1851 but apparently drawn some time before; it is not mentioned in the 1858 list of saw and grist mills.

The second successful grist mill to appear in Smith Township is "Benson's Mill", already mentioned in connection with Thomas Benson's activities in Peterborough. It was first assessed in 1839 and was, therefore, not built by Thomas Benson, but probably by his brother, John R. Benson. A road leading to "Benson's Mills" is shown on Sandford Fleming's Plan of the Town of Peterborough, drawn in 1846, and the mill itself appears on his map of 1848. By 1845, the mill was definitely either owned or leased by Thomas Benson.

Another grist mill appears in the official Assessment Returns in 1845, but disappears again in 1847. This mill probably stood at the western end of the Stewart dam, opposite Stevenson's sawmill, and was the one that later became known as the "Blythe Mills". It does not appear on Fleming's map of 1848 but is shown by W.H. Smith in 1851. By 1858 the Blythe grist mill was owned by "Herst & Denne", and

* Guillet, Valley of the Trent, pp. 90, 104.

its location was given as "on Otonabee River, about a mile from the town of Peterborough". At that time it had three run of stones and the impressive capacity of "600 barrels of flour a week".

(d) Otonabee Township

The first mills in Otonabee Township were built on the Indian River, "2 miles from the Lake", by Dr. John Gilchrist. The Assessment Returns indicate that the sawmill and dam were probably built in 1826-27 and the grist mill some twelve months later. The former was assessed in 1827, but not in the previous year. Similarly, the grist mill was probably in operation during 1827, as it was assessed for 1828. Poole, however, gives the date of building as 1825. It is not clear whether Dr. Gilchrist, in stating that his mills stood "2 miles from the Lake", was measuring in a direct line or by the windings of the river. The implications of the word "lake" are likewise uncertain; he may have been referring to the present highwater mark of Rice Lake (very much the same as in 1840, when Gilchrist's letter was written) or else to the old highwater mark before the building of the dam at Hastings.

At any rate Gilchrist, writing to Kenneth Cameron, the then Acting Surveyor-General, on December 8, 1840, complains that due to the erection of a dam

"...at Crooks rapids below the Rice Lake, the water in the Lake has been raised to such an extraordinary height as to render my Mills on the Indian River 2 miles from the Lake quite useless at almost the only time they were capable of doing a good business."*

What Dr. Gilchrist meant was that the flow of the Indian River was deficient, except in the spring, when it received part of the discharge of Stony Lake. It was to make

* Ontario Department of Lands and Forests: Survey Records. Letters Received, Vol. XVIII, p. 349.

this additional flow available for a longer period that Gilchrist and Zaccheus Burnham had made a cut through solid granite on Lot 30, Concession VI, in Dummer. Evidently the spring period of highwater on Rice Lake backed the river up on the wheels of the Gilchrist Mills just when the Indian River was receiving this extra high flow. From this it would appear likely that the first mills at Keene were rather lower down than the later mills, ruins of which are still standing. It seems probable, however, that the later arrangement of a long mill race from a dam some distance above the mills was used in 1826-28, though the first dam may also have been somewhat closer to Rice Lake.

In 1835 a second run of stones was added to the mills at Keene. They were assessed for a third run in 1843, but this was either returned in error or soon fell out of use. Only one grist mill was returned for Otonabee Township before 1850. In that year there were three grist mills in the township: one at Keene, one at "Allandale" (now Lang), and the other, pretty certainly, at "Peterborough East". In 1858, all three were in operation. The mill at Keene was now the property of Mark Burnham, and its three run of stones were capable of grinding "250 bushels of wheat daily". The "Otonabee Mill" in Peterborough East, owned by R.D. Rogers, was a "substantial stone building, four run of stones, manufactures 100 barrels of flour a day". Thomas Short's "Allandale Flour Mill" was the most impressive of the three:

"...an excellent stone structure - is fitted up with all the modern appliances for manufacturing merchantable flour. It has four run of stones and two bolts for country use. The building is also fitted up with an oatmeal mill, with kiln, &c., for preparing the oats. It is driven by water power; but a forty horse power engine has been placed in the building in case of failure of water. Besides the country work, from 6,000 to 8,000 barrels of flour are exported from the Allandale Mills."*

* Guillet, Valley of the Trent, pp. 276-7.

The saw and grist mill on the north side of the pond at Millbrook was owned by James Deyell in 1861.



The Allandale Mills at Lang were probably built by Thomas Short, M.P.P., between 1840 and 1850.

(e) Asphodel Township

The first grist mill in the Township of Asphodel was that erected by Joseph A. Keeler of Colborne at the present site of Norwood, about the year 1825. It first appears in the Assessment Returns of 1826, and the Rev. George C. Street, writing in 1840, still refers to Norwood as "Keeler's Mills". According to Poole, Keeler's original mill "contained a single run of rock stones, driven by a tub water wheel and a bolt, covered with muslin". In 1836, however, under the management of Peter Pearce, who "was also agent for Mr. Keeler's property at Norwood", considerable improvements were made:

"...a second run of stones, (those known as the bur stone) was added to the one already in use in Keeler's mill. A smut machine, and also an improved bolt, were provided at the same time..."*

This second run of stones was not, however, returned until 1839, which probably indicates that it was not installed until 1838.

The second grist mill to operate in Asphodel was the one built by the Hon. James Crooks at the present site of Hastings, in 1835, according to Mr. Edwin C. Guillet. A second grist mill appears briefly in the official Assessment Returns for Asphodel, in 1841 and 1842, reappearing consistently after 1846. In 1851, according to Mr. Guillet, the mill seat and water power, together with 1,171 acres of land, were purchased from Crooks by Henry Fowlds, a native of the Isle of Skye. Poole, however implies that Fowlds and his sons did not actually move to the site of Hastings until 1857. This mill and the preceding one both appear on Sandford Fleming's Map of 1848, and in 1858 the Hastings' Mill is described as having three run of stones, and a daily

* Poole, Settlement of Peterborough, p. 160.

capacity of "250 bushels wheat".*

James Bonter is listed as "miller" for Norwood in Lovell's Canada Directory of 1851. Poole adds that, "within a few years" after 1848 (by 1851, it would seem, according to the Provincial Census Returns), "a fine stone grist mill, of four stories, and several run of stones", was built by Thomas Buck. However, there is no further reference to Thomas Buck, although P.M. Grover appears as a "mill owner" in the Canada Directory of 1857-58 and, in 1858, was leasing it to L.P. Lewis. At that time, Grover's mill had two run of stones, and could grind 200 bushels of wheat per day.

There is a possibility that the second operative grist mill in Asphodel during most of the 1840's belonged to Thomas Walker of Westwood. At any rate, the Rev. George C. Street writes of having "preached to a good congregation at Walkers Mills". There was certainly a sawmill at Westwood during the 1840's, but the Reverend Mr. Street's use of the plural, "Mills", would seem to imply an attached grist mill. Although there is no directory material available for Westwood during this period, and only a sawmill is shown there on the 1848 map, there was certainly a grist mill with two run of stones, the property of "Messrs. Ewing and Roxborough", operating at the village by 1858.

* Guillet, Valley of the Trent, pp. 153, 264; Poole, Settlement of Peterborough, p. 162.
The Hon. James Crooks was prominent throughout Upper Canada as a mill-owner, land speculator, merchant and politician. Poole, however, calls (p. 160) his mill at "Crook's Rapids" "a small frame building...containing one run of very common stones". It is doubtful whether it ever ground much, and is believed to have "been intended rather as a means to secure the valuable mill privilege, at that place, than for practical utility". In 1846 Thomas Walker had been Postmaster for Asphodel, but by 1851 the Asphodel Post Office had been shifted to "Fowld's Rapids". The fact that James S. Fowlds, a son of Henry's, was Postmaster in that year shows that he, at least, had moved to the site of Hastings by that time.

The Provincial Census Returns for 1851 show that Asphodel was one of the more active townships of our region in the milling industry. In fact, three water grist mills in Asphodel were grinding no less than 11,500 barrels of flour per annum; the same number of mills in Otonabee were producing 26,550 barrels; while the two mills in Peterborough were grinding only 9,000 barrels.*

(f) Douro Township

In the summer of 1830, it would appear that Thomas Stewart was seriously considering the erection of a saw and grist mill, Lot 2, Concession XII, of the Township of Douro. At any rate, his wife writes that:

"Our mill is going on prosperously. We are only to have the sawmill now. The grist mill is to be added and the dam finished next summer when the water is low. Scott says he will engage them to be the best mills in the district. The foundation of the dam is completed. The carpenters are now preparing wooden patterns of the wheels which are to be sent to the foundry at Rochester to have metal castings made from them. We have a blacksmith at work...The wood for the models of the wheels has to be boiled and dried at a fire to harden before they begin to turn them."†

In the end, however, the Stewart establishment functioned merely as a sawmill, and Douro had to wait several years for its first grist mill.

N.H. Baird reported that a grist mill was building at "Herriot's rapids" in the summer of 1835, and he shows "Herriot's Mills" on his 1836 map. However, no grist mill is assessed in Douro until 1845, and none is returned after 1848. According to Poole, the "first grist and saw mill on the Douro (side of the Otonabee at the present site of Lakefield) were burned down, and the village...declined, and was for several years neglected". After this

* The figure actually given for Asphodel, 115,000 barrels, is obviously a printer's error.

† Our Forest Home, p. 122.

fire, which may have occurred in 1848, there seems to have been no grist mill in Douro, although shortly after 1858 a Mr. D'Arcy is said to have erected a "large frame mill", probably a grist mill, at Lakefield, on the Smith side of the Otonabee.*

(g) Dummer Township

According to Dr. Poole, a combination saw and grist mill was erected "on the Indian river, at what is now the village of Warsaw", about 1834-35. The Assessment Returns indicate that the sawmill was probably operating in 1835, but the grist mill does not seem to have begun grinding until 1836-37. Poole also says, erroneously, that these mills

"...were the property of the Hon. Zaccheus Burnham, and were under the local superintendence of Mr. Hartwell, who resided at the mills, and who conducted the first store there, and who as late as the year 1844 was appointed first local Superintendent of Schools for the township..."†

In point of fact, however, the mills at Warsaw were built by Thomas Hartwell, formerly an innkeeper in Hope Township, on whose death they became the property of Zaccus Burnham. Unless two Hartwells are in question, Poole's statement above is certainly erroneous, as Hartwell was dead at the time of Burnham's letter (1840), which will be quoted below, and cannot possibly have been a Superintendent of Schools in 1844. There also exists a local tradition to the effect that Thomas Choate, formerly miller at the Upper Mills at Port Hope, was concerned in the building of the mills at Warsaw. This tradition probably refers to a later rebuilding, perhaps of the stone mill still standing. Thomas Choate is described as "the first settler in Warsaw" and may have

* Poole, Settlement of Peterborough, p. 155.

† Ibid, p. 175. Although his name is sometimes spelled "Zaccheus", Burnham seems to have signed himself "Zacheus".

leased the first mills. Thomas G. Choate owned the Warsaw Mills in 1851 and they remained in his possession until at least 1869.

On December 6, 1840, two days before Dr. Gilchrist did so, the Hon. Zaccheus Burnham addressed a letter to the then Acting Surveyor-General, pertaining to the cut which they had made from Stony Lake in order to improve the water supply to their respective mills on the Indian River. Burnham describes the situation that had compelled him to explore the course of the river and to make the cut:

"Lot No. 12 in the first Concession of Dummer was reserved by Government for a Mill Site on the Indian River. Mr. Thomas Hartwell built Mills there and received a Patent for the said Lot, after which he died and the property became mine. The Indian River had been considered sufficient to run a saw and Grist Mill the whole year, but, after the Mills were built, it was found otherwise; although a great flow of water came down the stream in the Spring and Summer, it almost always failed late in the season and Winter, so much so that the mill could do but little business. Upon making enquiry, it was said by the Indians, that the water came from Stoney Lake down the Indian River, when the water was high, but when the Lake fell, the water discontinued coming that way."

Burnham disclaimed all intention of causing property damage to others by his cut, which, he carefully pointed out, merely consisted of deepening an existing channel. He also professed astonishment at rumours that had been circulating at Peterborough, to the effect that:

"...the Otonabee River had fallen one foot, in consequence of my having drawn the water from Stoney Lake, and this was three weeks before the lock was excavated...!"*

A second grist mill appears briefly in the Assessment Returns for Dummer in the year 1847. Its presence

* Letter from Zaccheus Burnham to the Surveyor-General. Ontario Department of Lands and Forests: Survey Records; Letters Received.

and location are difficult to account for; it may represent a simple error, or it may have stood on Lot 3, Concession IV, between Cottesloe and Norwood, where a stone foundation can still be seen.

2. The Lumber Industry, 1820-1867

(a) The Squared Timber Trade

Prior to 1826, the only persons authorized to cut timber on the Crown Lands were the contractors for the Royal Navy, or those holding licences from them, and there was great infringement of the regulation, and much illicit trade, but in this year the contractors' monopoly was terminated and a fixed scale of rates established by the Crown. The selection of mast timber was made by government agents, using the Royal broad arrow as a blaze. As late as 1827, when Peter Robinson was appointed Surveyor-General of His Majesty's Woods and Forests in the Province of Upper Canada, he received special instructions to take inventory of the Province's resources in masting timber.

The essential qualifications for good masting timber were length, straightness, and a small butt in relation to the height of the tree. In cutting these, great care was taken to make sure that the timber would not be broken or injured in felling. Usually, a bed was prepared by clearing away logs and small trees, and by levelling any irregularities on the ground with brush to break the force of the fall. In Central Ontario, masts were cut both summer and winter. After felling, the bark was removed, and the butt end of the tree was squared for either eight or ten feet, ready for fitting into the mast block of the ship. For summer hauling, the front end of the mast was lifted by a winch under a pair of heavy wheels, eight or nine feet in diameter, connected by a concave axle. At the rear end it was slung under a similar, or sometimes smaller, pair of

wheels. A sufficient number of teams, frequently a dozen or more, was then used to haul the mast to water. In winter, heavy sleighs (sloops) were used, and sometimes, with an exceptionally large timber, a long double-tree was fastened at right angles towards the rear end of the mast, with a team hauling on each side.

The reminiscences of Robert Harrison of Asphodel Township, a former lumberman, published in the Peterborough Daily Evening Review, October 27, 1902, gives some idea of the difficulties frequently encountered in the winter hauling of mast timber. Mr. Harrison describes in detail an incident that occurred in late winter on the slope down to "Delaney's...a splendid landing on the Trent, two miles below Hastings". On this occasion an extraordinarily large mast, together with its sleigh, had "jacked" or capsized on "the mast-road at the foot of a ridge". The following morning, the mast and sleigh were righted and drawn by twenty-two teams, each horse of which carried a rider postillion-fashion, to the brow of the long slope of "Delaney's". "Urton Hill then mounted the mast with a six-pound 'blocking axe', so as to sever the 'mast chain' when required, and the descent was begun, with the assistance of peeled skids. The mast and sleigh, gathering momentum, almost ran down the horses, and finally broke through the softening ice of the Trent, together with twelve span of the rear horses. However, Hill cut the 'mast chain' at the crucial moment, and the rear horses and their riders regained the safety of the sound ice."*

The squaring of timber, whether trimmed to a fine "proud edge" as at first, or left with a rounded shoulder or "wane" as in later practice, followed a definite procedure.

* Guillet, Valley of the Trent, pp. 269-270.

First, the "liner" would select the part of the felled tree to be included in the timber. He then indicated where the line of the square should fall, generally by cutting a notch into the bark. Next, with a chalk line he marked the line of the section (slab) to be taken off. Then the "scorers" mounted the trunk and notched the side at four-foot intervals, almost to the depth of squaring, and with a special scoring axe knocked the four-foot chips off the side of the trunk. After this the "scorers" hacked parallel vertical rows about four inches apart along the full length of the timber. Then came the "hewers", with large broad-axes, who shaved it to a planed surface. The tree was then "turned down", and the other sides were squared in the same way.

The amount of timber available for cutting and squaring in the Otonabee region was, of course, reduced substantially by the clearing practices of pioneer settlement. The great staple of the lumber trade was white pine, but great quantities of valuable trees were destroyed before it became an article of export. In the words of Dr. Poole:

"...Formerly, before we learned of its value..., it was burned up in log-heaps or split into fence rails, and a considerable portion of the elm and oak of the older townships shared the same fate. Red pine exists but sparingly, and though some excellent spars of this timber are still [1867] sent to Quebec from this country, the care required in their preparation, and the expense attending their removal, have in general, left but a limited margin of profit for the manufacturer."*

Early lumbering procedures, compared with the standards of cutting now applied, were selective in the extreme. Some idea of the standards of selection then used and of the quality of timber available can be gathered from Robert Harrison's reminiscences. According to Mr. Harrison, in the year 1832, in Asphodel,

* Poole, Settlement of Peterborough, p. 92.

"...from a pine tree little more than three feet in diameter at the ground we cut eleven twelve foot sawlogs; the top end of the top log was a foot in diameter, and showing but a few small knots...On another occasion we took out a mast from Lot 15, con. 4, that measured one hundred and twenty feet in length, and had a diameter of forty-two inches at what was known as the 'first partner', which, in that instance, would be the distance of forty feet from the 'grub', one-third of the entire length. The largest piece of square timber ever taken out in Asphodel was cut on the west half of Lot 12, con. 3, by the men employed by Foley and Grover of Norwood. The stump of the tree, where cut, was seven feet six inches in diameter, and the piece contained by admeasurement nine hundred and sixty cubic feet of timber..."*

As might be expected, this highly selective lumbering, coupled with the destruction of forest resources by settlement, led to a gradual retirement of the main operations of the lumber industry north of the Otonabee region proper, and further into the "back country". Nevertheless, one must agree with Dr. Poole that the town and county of Peterborough, in the year 1867, owed "a large share of their past success and present prosperity" to the trade in lumber, both squared and sawn. The squared timber industry was of comparatively recent date in the Otonabee region, apparently beginning about 1838, when "Mr. Hickson removed a quantity of spars from the vicinity of Buckhorn lake". However, Edward Hickson, and the Quebec firm of Gilmour and Company, appear to have undertaken their chief operations in "the townships fronting on the Otonabee and Trent rivers". During the early years of the industry, Hickson resided over a saddlery in Peterborough. Only after 1844, according to Poole, "was much of this business extended above Lakefield", when John Cook and his son Ira commenced operations further "back".

The seat of the squared timber industry gradually shifted towards the rugged Laurentian country north of the Otonabee region. The Cooks and the Gilmour Company operated for a few years above and around Burleigh Falls.

* Guillet, Valley of the Trent, pp. 268-269.

Mossom Boyd was one of the earliest manufacturers of squared timber above Buckhorn Falls. Boyd had begun "to produce sawn timber for local supply, but ere long began the manufacture of square timber in large quantity, for the Quebec market". Some years later, the considerable timber resources of the Pigeon Lake area were also tapped commercially.

In addition to "Charles Perry, Esq.", Dr.

Poole names:

"...a host of enterprising men in the square timber business, among whom were Messrs. Kempt, McAuley, Dickson, Townsend, Platt, Cockburn, Fowlds, Gilchrist, Dennistoun, Leeper, Strickland, Short, Scott, Buck, Stone, Smith, Caldwell, Thompson and others..."*

The Trent, the Indian, the Otonabee, and possibly Cavanville Creek, were all used for running timber. In the year 1848-49, John Langton, in partnership with Mossom Boyd and James W. Dunsford, entered the squared timber trade, purely as a "feeler", as he himself admits. However, in a letter to his brother in England, dated April 1, 1849, Langton confidently predicted profits of 100 per cent, although the partners had begun operations "too late...and at the wrong place first". He also estimated the total cost of the venture at a maximum of £3 per stick, "and of that nearly £1, consisting of wages of raftsmen, lockage, towage, etc., are not payable, by the custom of the trade, till the raft reaches its destination".

Writing again on May 23, this time from Peterborough, John Langton describes the "run" down the Otonabee. Although the raft had been frozen fast for a fortnight longer than usual, "with expenses running on at the rate of £2 a day", and despite a stiff head wind, Buckhorn and Burleigh Rapids were passed without further delay or incident. At the Burleigh Rapids the raft was broken up and the spars run

* Poole, Settlement of Peterborough, p. 93.

down "nine miles of consecutive rapids". A few "sticks" reached Peterborough within about an hour, but most of the spars jammed and had to be freed by one or other of the following methods:

"...Sometimes you fix a windlass or have horses on shore, sometimes the men go on to the jam and loosen the sticks with handspikes, and sometimes you have to sacrifice a spar by chopping it..."

A third letter, written on June 18, stated that the lumber had reached Peterborough, "with the loss of only four sticks left behind and available for next year* and one spoiled". Langton believed that the whiskey available at Peterborough would delay the "drive" as much as "the waters of any rapid", but his optimism remained unshaken, as the following estimate illustrates:

"...My first estimate of the cost down to Peterborough was £2 or £2.5s. per stick, but I do not think they have cost more than £1.10s. or £1.15s. at farthest. £1 more will certainly take them down to Quebec. What they will fetch there it is impossible to find out..."

John Langton was of the opinion that the greatest danger in the lumber business was overinvestment of capital at hand in land and timber rights. He also seems to have considered lumbermen and loggers alike as prone to rascality:

"...They [i.e., the loggers] are a lighthearted set of dare devils and the greatest rascals and thieves withal that ever a peaceable country was tormented with. Hen roosts have quite disappeared from the river side and lambs and little pigs have to be kept under lock and key...The men steal hens and their masters steal trees..." †

On June 23, 1851, Henry Fowlds Sr. wrote to his son James from Quebec. The letter contains a variety of information and instructions. Fowlds appears to have hired a steam tug at £8.15s. for his own raft, but says that his

* Each stick had its owner's personal mark cut, branded or painted on it.

† Langton, E.W.A. Early Days in Upper Canada; Letters of John Langton, Toronto, 1926, pp. 201-209.

son Henry urgently needed three sails for his. One may also infer from his references to "Mr. Crooks" that the purchase of the mill and property at Hastings was being negotiated at the time of writing. Fowlds had paid his hands a total sum of £250, "honestly and as I think fairly without any grumbling". It would appear, from what he says, that lumbermen made a common practice of "running" their timber together:

"My five Drams got down in Safety Saturday afternoon the weather calm land 12 drams in Gilmours Booms containing three of Adam Earhearts gathered timber and 9 drams of Charles Townsends Mine with 3 drams of Gilchrists was to have been left at Mr. Walkers we lay far out in the tide water there being a large Ottawa Raft between us and the loading Pears..."

Fowlds also mentions that timber was then selling at Quebec at "as high as 7d. per foot from samples in Shipping order".*

Shipments of squared timber, some of which must have either been cut in or have passed through the Otonabee region, from Port Hope Harbour in the year 1879 are known to have amounted to 50,000,000 feet. Dr. Poole provides us with further statistics illustrating the volume of the squared timber trade in and around our area:

"...In 1852, the quantity of square timber from the entire country [of Peterborough] was estimated at 1,600,000 feet. In the season of 1864-5, 3,500,000 feet were exported from this county, and about 1,500,000 from the neighboring county of Victoria. During the lumbering season of 1865-6, the quantity passing down the Otonabee was about 2,000,000 feet, to which 500,000 more may be added for the eastern portion of the county, finding an outlet by way of Crow river. The present season (1866-7) promises a quantity in advance of last year..."†

By this time a decline had already begun in the volume of the squared timber industry in the Otonabee region.

* Guillet, Valley of the Trent, pp. 264-266. According to the first edition of Murray's Dictionary, Vol. III, p. 639, a "dram", in lumbering, is a "collection of cribs, forming a section of a raft of staves". It would appear, from one of the examples cited, that the average "dram" measured about 50' x 200'.

† Poole, Settlement of Peterborough, p. 93.

(b) Sawn Timber and the Sawmilling Industry

As was the case elsewhere in Ontario, sawmilling in the Otonabee region began as a purely local industry, supplying the immediate requirements of the inhabitants, and only later assumed commercial proportions. This change occurred, in the main, during the 1840's and '50's, in a period when the muley saw was being replaced gradually by the circular saw. There were other innovations in the lumber industry; the old method of felling trees by the axe was superseded by sawing, and the old cross-cut saw with uniform teeth was replaced by the drag-tooth, or modern, cross-cut saw.

Since the demand of the early settlers for sawmills coincided with and complemented their desire for grist mills, the former establishment was not infrequently attached to the latter, and both were sometimes housed in the same building. In fact, such was the case with most of the early mills in the Otonabee region. James Deyell's milling establishment in Cavan included a sawmill from the first, although Galloway's mill began simply as a grist mill. According to Dr. Poole, Adam Scott's small mill housed both millstones and a single upright saw. The first sawmill in Smith Township was assessed in 1826 to William and Joseph Dickson, on the west half of Lot 1, west of the "Communication Road". "Gilchrist's Mills" in Otonabee Township comprised a saw and grist mill, as did "Keeler's Mills" at Norwood. As we have seen, Thomas Stewart began with a sawmill in Douro, but his intention of adding a grist mill appears never to have been realized. At Warsaw, Thomas Hartwell's sawmill seems to have been cutting for the better part of a year before his grist mill commenced operation.

The following is a table of sawmills operating in the eight townships (North and South Monaghan appear

simply as "Monaghan") of the Otonabee region in various selected years; it is not intended to illustrate fully the fluctuations in the number of sawmills that occurred:

Name of Township	Year and Number of Sawmills						
	1826	1831	1836	1842	1847	1851	1858
Asphodel	1	1	2	3	4	4	5
Cavan	1	4	2	5	11	9	12
Douro	-	-	2	2	4	3	5
Dummer	No returns	-	1	2	2	3	4
Monaghan	1	2	2	1	3	3	1
Otonabee	1	1	2	1	3	4	6
Smith	-	1	1	1	3	6	6
Peterborough						2	-
Total	4	9	12	15	30	34	39

The statistics for the year 1826, 1831, 1836, 1842 and 1847 are taken from the District Assessment Returns, published in the Journals of the Legislative Assembly. Those for 1851 are drawn from the Provincial Census of that year, while the figures of 1858, with the exception of that for Cavan, are taken from the Directory of the United Counties of Peterborough and Victoria for 1858. The compiler of this directory does not actually locate any sawmills in Peterborough proper, although he places four of those he lists in "Peterborough East" (Ashburnham, still an incorporated village at that time); these sawmills are included in the 1858 total for Otonabee Township. The compiler also lists sawmills adjacent to Peterborough in Smith. The two sawmills that appear for Peterborough in 1851 had gone out of operation by 1858; no separate statistics are given for Peterborough prior to 1851, since it was not incorporated until 1850. The figure of

twelve sawmills, given for Cavan Township in 1858, is actually derived from a manuscript, which will be referred to again, prepared by Thomas Benson in 1856 in connection with railroads.*

The official Census Returns for 1851 give both the number of sawmills operating in each township and their total production, as well as their means of propulsion and the number of hands employed. Thus, Cavan had nine sawmills operating, one of them steam-powered. Although five of these mills made no return, the remainder appear to have employed 14 hands and to have cut 680,000 feet. The two mills returned for Peterborough proper employed 11 hands and cut 1,200,000 feet. Three sawmills in Monaghan employed five hands and cut 1,113,000 feet. Douro had three sawmills, cutting 1,400,000 feet, the four in Otonabee produced 800,000 feet, the same number of sawmills in Asphodel cut 810,000 feet, and no sawmills were returned from South Monaghan. The returns for Dummer and Smith are combined with those of Burleigh and Harvey respectively, three mills in the former combination sawing 230,000 feet and six in the latter cutting 6,019,000 feet.

Thomas Benson's manuscript table, cited previously, gives 4,250,000 feet of lumber as the total production of the twelve sawmills in Cavan during the year 1855-6 - probably a considerable increase since 1851. The 1858 list of sawmills gives a good idea of the size of some of the sawmills operating in the area at this time. Among the smaller mills were that of P.M. Grover at Norwood, with one saw and a daily capacity of 4,000 feet, T.G. Choate's sawmill at Warsaw, whose one saw could cut 3,000 feet per day, and "Buck's Saw Mill Lot 8, 9th Con., Dummer. 1 saw, 2,000 feet a day". Two steam sawmills, operating at and near Bridgenorth, are cited as cutting 300,000 and 500,000 feet during the summer

* Unpublished manuscript.

months. The largest mills, however, were operating in the vicinity of Peterborough, as the following excerpts from the list will illustrate:

"Nassau Mills. Charles Perry, Proprietor. This, which is the largest and most complete mill in the Counties, and one of the finest in the Province, is situated about three miles from Peterboro', in the Township of Smith. A challenge to cut against any other mill in the Province remains unanswered. It has 2 'yankee gangs', a 'slabber', 'stock gang', and an 'English gate', containing in all 130 saws, besides circulars for butting, cutting laths, &c. It has also a very ingenious machine for grinding slabs. This mill has cut 90,000 feet of lumber in 12 hours.

"Perry's Mill. E. Perry & Co. Proprietor. Situated about two miles from Peterboro', in the Township of Douro. Contains 3 gangs and 1 span in all 100 saws, besides circulars for edging, butting, cutting laths, &c. Averages when cutting about 60,000 feet in twenty-four hours.

"Snyder's Mill: Wm. Snyder, Proprietor. About two miles from Peterboro' in Township of Smith. This mill is similar to the preceding one, and of about equal capacity."*

Dr. Poole estimates, on the basis of assessment returns it would seem, that a total of 50,650,000 feet of sawn lumber was exported from Peterborough County in 1866. In his detailed breakdown of this figure, Poole gives the following production figures for a number of mills then operating within the Otonabee Authority area:

"From Messrs. Campbell & Co's, Nassau Mills	Ft.10,000,000
" Mr. George Hilliard's, Blythe Mills	7,000,000
" Samuel Dickson's, Peterborough	6,000,000
... "	
" Shaw & Waite, Buckhorn and Lakefield	9,000,000
... "	
Mr. S.S. Kelly's mill, Bridgenorth	250,000
Messrs. Hale's mill, Otonabee river	1,500,000
" Craigie & Stephenson's, Ashburnham	400,000
" Fowlds', Hastings, say from this county	1,000,000"†

Calculating at the then current Port Hope price of "\$12 per 1000 feet", Poole concluded that the export of sawn lumber from Peterborough County in 1866 would realize roughly \$600,000.

* Guillet, Valley of the Trent, p. 275.

† Poole, Settlement of Peterborough, p. 95.

The advent of the railways naturally affected the trade in sawn lumber; the traffic in squared timber continued to make use of the Otonabee and Indian Rivers, while rafts and log booms were assembled on Rice Lake for passage down the Trent. Poole estimated that about 32,000,000 feet of the lumber sawn in 1865 would be shipped via Peterborough, and that "the greater portion of the remainder" would be "first transferred in boats or scows to Lindsay, and from there...passed over the railroad to Port Hope". The sawn lumber shipped from Peterborough was teamed "to the railway station, or to the head of navigation at 'the locks' on the Otonabee river". During the year 1865, 19,000,000 board feet of sawn lumber were carried by rail to Port Hope, while "about twelve millions passed down the river in scows, in tow of the steamer Otonabee to Harwood, where it was placed on the railway, and so conveyed to Cobourg". Poole was of the opinion that the year 1866-7 would show a substantial increase in the amount of lumber transported by rail to Port Hope, at the expense of "the river and Harwood route". The extension of the Port Hope line to connect with the old Chemung railway prevented the line to Lindsay from fully exploiting the lumber traffic.

Dr. Poole closes his chapter on the lumber trade with a remark on the wear and tear inflicted on the streets of Peterborough:

"The operation of teaming such an immense quantity of lumber from the mills to the points mentioned, is one involving great labor and expense to the manufacturers; although giving employment to a large number of teamsters and their horses. The constant passing of such heavily laden teams over our principal streets, rapidly wears out even the most substantial material employed in their repair, plows them into deep and unseemly ruts, and at certain seasons, renders them well nigh impassable to ordinary vehicles."*

* Poole, Settlement of Peterborough, p. 96.

As the lumbermen exhausted available forest resources and pushed farther north, a gradual decline in the sawmilling industry within the Otonabee region ensued. Another significant factor in this decline in importance was the development of the portable steam sawmill, which enabled the sawing operation to be carried closer to the site of cutting. However, these factors did not influence the local demand for sawn lumber, and, moreover, quantities of timber were still brought into the area for sawing, so that several sawmills continued in operation well into the present century. The topographic map prepared by the Canadian Department of National Defence in 1929 shows no less than 14 sawmills working in the area. Some of those have since closed down, but sawmills are still in operation at Peterborough, Bridgenorth, Millbrook, Lang, and Warsaw. The Forestry section of this report contains a synopsis of sawmilling activity in the Otonabee region at present.

3. Other Industries

Distilling was an industry closely allied to grist milling in the settlement of this Province. Dr. Poole, in his rather uncomplimentary description of Adam Scott's mill, mentions the "impotent distillery" that operated in an adjoining building:

"...In the absence of a metallic 'worm' the vapor was passed through a long wooden tube, cooled by the application of water, and thus condensed, the aqueous spirit oozed from the further extremity. No means of rectification were available, and the whiskey thus produced contained the empyreumatic oil and other impurities, which, as well as the disagreeable flavor these occasion, the whiskey drinker of that day had to endure as best he could..."*

This distillery seems to have gone out of operation in 1827.

* Poole, Settlement of Peterborough, p. 14.

Distilleries do not regularly appear in the District Assessment Returns. However, a total of eleven distilleries was returned in 1840: one in Asphodel (which is returned with Belmont), two in Cavan, six in North Monaghan, and two in Otonabee Township. The 1843 Returns indicate an apparent decline - only three distilleries in all, two in North Monaghan and one in Otonabee. In 1845 one distillery was returned for Asphodel and three for North Monaghan. Another distillery was assessed for Smith in 1846-7. According to the Provincial Census of 1851, the three distilleries then operating in Peterborough employed seven hands and produced 3,600 gallons in the same year; a brewery was returned for Otonabee Township, possibly the same as the one operated in Ashburnham by Henry Calcutt in 1869.

In the early days of settlement, distilleries were frequently connected not only with grist mills but also with stores, since storekeepers, as well as millers, were likely to have quantities of grain on hand.

Another industry, connected with both distilling and grist milling, was the manufacture of staves and barrels, for which, as Thomas Benson's correspondence shows, there was a considerable demand. In 1851 Cavanville, Millbrook, Norwood, Peterborough and Warsaw each had one cooper, and Peterborough probably had more. Peter Landerville seems to have been a cooper at Keene from 1857 to at least 1864.* By 1869, there were two coopers at Ashburnham, two at Bridgenorth, two at Norwood, and one at Warsaw.

Since the tanning process in the last century required a convenient supply of tanbark and water, tanneries were quite frequently to be found in the vicinity of sawmills. Unfortunately, tanneries do not appear in the official Assessment Returns, although we know that by 1846 there were already

* His name appears as "Landswille" in the 1864-5 Directory.

three tanneries in Peterborough and one each in Cavanville, Keene, Millbrook, and Norwood; Joseph Thompson's tannery at Cavanville appears on Tremaine's Map of 1878. The 1851 Census shows one tannery in Asphodel, two in Peterborough, each employing ten hands and tanning 2,600 "sides", and three in Cavan, two of which employed two hands each and tanned a total of 110 "sides". Lovell's Canada Directory of the same year names Thomas Kells as a "tanner and currier" at Millbrook, while the tanner at Norwood was Thomas Foley. The 1861 Census shows five tanneries for the whole of Peterborough County. Harness-making was an allied industry, and some of the "dealers in leather" listed in later directories probably did their own tanning and currying.

Woodworking was another important branch of early industry, and the various directories list numerous "cabinet makers", "waggon and carriage makers", builders, contractors, and carpenters. According to W.H. Smith, there were no less than four "chair factories" in Peterborough in 1846. Other chair factories are listed in various villages and some were to be found on isolated mill sites. Chairmakers made any type of furniture that consisted chiefly of turned or shaved parts - bedsteads, settees, cots, cradles and a wide range of stands and tables, besides chairs of different types of solid, rush or cane seats. The lathes could easily be run by water-power and the chairmakers' shops were mechanized earlier than the cabinet shops. "Turners" also appear on the lists; they supplied turned parts to cabinet-makers, chairmakers, builders and carriage makers, though all of these might have their own lathes. The fashion for turned furniture declined in the 1860's and the chair factories begin to disappear, though one was in operation on Lot 17, Concession V, in Cavan Township from 1861 to 1878.

By that time there were large furniture factories in many parts of Ontario; there was one (Brown's) in Peterborough in 1869. In the smaller places, the cabinet-makers' shops continued to exist, the trade being often combined with undertaking. However, by 1869 "furniture dealers" begin to replace "cabinet makers" in the lists; less and less hand-made furniture was being turned out locally. Cabinetmaking, on the whole, remained a trade in this area until a late period, but has not been among the major industries.



Warsaw Presbyterian Church with
driveshed, dated 1856.



The Roman Catholic Church at
Keene was built and enlarged
between 1850 and 1875.



The style of this double store
building at Keene is that of
1845-50. The elaborate doorway
may have given access to an
hotel.

CHAPTER 4

ROADS

1. The Roads of Access

(a) The Cavan Road

There had been trails from Lake Ontario to Rice Lake from the earliest times. The one used as a portage ran from the Ganaraska at, or a little above, Port Hope to some point near Bewdley, almost certainly to what was later called Somerville's Creek, a mile or so east of the head of the lake on the south shore. This was by far the easiest crossing of the divide, following as it did a depression between two stretches of glacial hills. It was frequently used as a short cut by parties descending from the Upper Kawartha Lakes, especially if they were going to Niagara, but its importance was reduced by the long journey on Lake Ontario needed to reach any of the forts, Frontenac, Oswego, Niagara or Toronto.

Nevertheless, the trail from "Ganeraske" was well known and is marked on a number of French maps. A kind of rough survey of it was made by John Collins, Deputy Surveyor General of the Province of Quebec, towards the end of the 18th century, and is shown on his map of the Trent System reproduced in "The Valley of the Trent". A tradition handed down by the first settlers at Smith's Creek (Port Hope) indicates that Lawrence Herkimer had a wagon or cart which he used to transport his goods to Rice Lake when he moved his post there in 1793 or -94. If this is reliable, the trail must have been cut out to some extent and its terminus may well have been shifted to a more convenient boat landing on the shore of Rice Lake. It was probably this "road" or "horse trace" that was examined by Collins.

In 1816 the north parts of Hope and Hamilton Townships were almost unsettled; there is no reason to suppose that any of the north-south side roads had been extended beyond

the sixth concession, if so far. The old portage trail remained the best access to the back country, but was little used except by Indians and fur-traders. Cavan Township, the first of the second tier from Lake Ontario to be surveyed and settled, was particularly inaccessible. It was far from any large body of water; no large stream traversed it, and no portage trail led through it. It is uncertain how far Cavanville Creek could be used even by canoes, though it was later believed that this stream could be made navigable for boats almost to the centre of the township. As there is evidence of Indian occupation of the eighth concession of Hope, paths may have crossed the morainic uplands into Cavan, but these were necessarily hilly and probably badly marked.

The lack of trails to the township and the difficulty this would involve for settlers were evidently realized in the Surveyor General's Office in 1817. Although Wilmot had reported that the first three concessions of Cavan were less suitable for settlement than the lands farther north, a large proportion of the grants made in 1817 were located in the south-east corner of the township, the part nearest to Rice Lake, and others were close to the eastern Townline, where the settlers would before long have the help of settlers in Monaghan in opening a road. It is not improbable that this line had been cut out by the surveyors from Lake Ontario as far as the north-east corner of Cavan and would at least serve the settlers as a landmark. It was not uncommon to cut Townlines and Base Lines in this manner, especially when they were also county lines.

Before many settlers can have established themselves in Cavan, a local movement (possibly inspired from above) was set on foot to obtain a government highway to the township by way of Rice Lake. In 1818 a petition signed by D. McGregor Rogers and seventy-four other magistrates and inhabitants of the Newcastle District was read in the Legislative Assembly, pointing out:

"That owing to the want of a road from the settled parts of the Townships of Hope and Hamilton, in the said District of Newcastle, to the new settlements in the Townships of Cavan and Monaghan... the inhabitants in those Townships suffer a great many privations and inconveniences."

and asking for money for a road to be surveyed and made, and adding:

"And your Petitioners further suggest that the road left by His Majesties surveyors between the Townships of Hamilton and Hope will be the most convenient for the settlers..."

A similar petition from the inhabitants of the Perth settlement, asking for a road from Brockville, was read on November 5, 1818. An Act entitled the "Perth and Cavan Roads Act" was introduced and was duly passed, under a different title, on November 11, 1818.* Zaccheus Burnham, then M.L.A. for Northumberland, was one of those who pushed the Act through its various stages in the House. Work seems to have been begun the following spring and a great part of the road was finished before the end of 1819. The evidence as to its early line through Hope Township is fairly clear. References in the Hope Township Records and Samuel Street Wilmot's plan of 1825† show that it left Walton Street in the village of Port Hope by the present Cavan Street**; followed the right bank of the Ganaraska to Choate's Mills (near Highway 401) and reached the line of the present Highway 28, below "Bletcher's Corners" (Dale) on old Dundas Street (Highway 105). From that point it followed the line of Highway 28 to Rossmount, but then continued straight on along the county line at least as high as the fifth concession of Cavan.

* Ontario Archives Report. Journals of the Upper Canada House, 1818-21, passim.

† Sent in response to a circular letter from the Surveyor General. The sketch plan is preserved in the Department of Lands and Forests, Survey Records.

** The present approach to Port Hope by Ontario Street was established as an alternative in 1825.

This may be accepted as the actual line, although various small-scale maps of 1816-34 show differing routes, all more or less inaccurate. Those of 1816-26 (based no doubt on obsolete originals) show a road terminating at Rice Lake, but the fine map published by David Taylor, R.N., in 1834, although it makes the road run directly north-north-east through Hope Township (apparently combining it with the other roads then open farther west) to the south-east corner of Cavan, is remarkably accurate beyond that point. After running for some miles up the Townline past "Monaghan" Post Office (then on the site of Bailieboro), the road is shown branching north-west to "Cavan" Post Office (Cavanville or Ida) by a too-direct route. The north-easterly branch is shown running at first north-by-east not far from the Townline and then tending more to the north-east on a course more parallel to that of the Otonabee, but usually some distance from the river until it reaches Peterborough.

The winter journey of the Hon. Alexander Stewart and his family, moving from Cobourg to their holding in Douro, "lay through the townships of Hope, Cavan and Monaghan". The first day, travelling from 9.30 a.m. to 4 p.m., they reached "Pages Tavern". Mrs. Stewart places this "Inn" fourteen miles from Scott's Mills and eighteen miles from their house in Douro. If these estimates are approximately correct, Page's was about eighteen miles from Cobourg and located between the site of Bewdley and that of Bailieboro; but the holding granted to Francis Page in Monaghan, on which he was assessed in 1821 and 1822, was Lot 1, Concession III, Monaghan Township, extending along the Townline from Centreville (South Monaghan Post Office) to the Millbrook Road. Centreville is only nine or ten miles from Peterborough by the older routes. Mrs. Stewart says they travelled "twenty miles a day" and that beyond Page's -

"...the 'road' scarcely deserved that name for it was merely a track through the snow where one or two sleighs had passed.

"We turned and re-turned through bushes and between trees. The boughs of the beautiful hemlock trees were loaded with snow and often bent so low that we were obliged to almost lie down in order to pass under them. Two or three times we had to stop that a pass might be cut for our sleighs where trees had fallen across the road. This day we drove nine miles through woods without seeing any habitation except some Indian huts."

This description shows that they had struck off across Monaghan from the Townline immediately after leaving Page's, for several settlers are assessed on either side of the Townline in both townships as high as Concession XI in Monaghan. Altogether it seems probable that Page's "Inn" was near Centreville and that Mrs. Stewart over-estimated the distance to Scott's Mills, though the nine miles without houses is accurate enough. Twenty to twenty-one miles in $6\frac{1}{2}$ hours seems slow, but allowance must be made for pauses to rest the horses as the sleighs were heavily loaded. In summer the rate was even slower. Samuel Strickland, with two men, a lightly loaded wagon and one horse, took three days to travel from the vicinity of Bowmanville to his first location in Otonabee Township in May, 1826, a distance estimated at a little over fifty miles.

The road had probably been improved to some extent between 1822 and 1826. When the Legislature voted money in 1831 to be granted to the Newcastle District for the improvement of main roads, it was ordered that part of the sum of £1,900 be spent "on the Road from Peterborough between Northumberland and Durham". It may have been in the 1830's that the line of the road was altered to run from Peterborough along Concession XIII in Monaghan to the middle of Lot 9, then across lots south-west to the south-east corner of Lot 7, Concession XII, along the concession into Lot 6 and again "cross lots" to the south-east corner of Lot 4, Concession XI, and along that concession to the Townline of Cavan. This is the route marked as travelled in 1848 on Sandford Fleming's map and his plan of Peterborough shows the "Road to Cavan" leaving the townplot by Sherbrooke Street.

Octagonal houses, such as this south-west of Millbrook, were a fad of 1840-65. Some tracery, probably arched, has been removed from the verandah.



This mantelpiece is in the east parlour of Birdsall's house, built about 1823.



The "Delta House" was built about 1865.



There seems to be no record of any gravelling or macadamizing of this road in the 1830's. After steamers began to ply on Rice Lake about 1833, attention tended to be centred on the road from Port Hope to Bewdley Landing. This "Port Hope and Rice Lake Road" was in fair condition by 1835 and free from corduroy. Until the thirties, improvement on Upper Canadian highways seldom went beyond "turnpiking", which meant locally crowning up with a plough to cover roots and smaller boulders and allow a little drainage into deep furrows at the sides. Larger boulders and stumps were sometimes removed, wet places "causewayed" with corduroy and a minimum of grading sometimes carried out. The result was a fair dirt track in dry weather.

The "Port Hope and Rice Lake Road" was gravelled by the government in 1845-46 and became a government toll road. The gravel road followed the line of Highway 28 to a mile or so beyond Bewdley, but Sandford Fleming does not indicate any gravelling along the Cavan-Monaghan Townline in 1848. The tolls in 1846-49 brought in a small net revenue to the government, but in 1850 this road was advertised, with other government toll roads, for sale by auction and was sold to the "Town Council of the Town of Cobourg" for £4,600, interest at 5 per cent to begin at once and be paid semi-annually and the purchase price to be paid in twenty annual instalments beginning on October 15, 1852. W.H. Smith, in 1851, says that parts of the road to Peterborough from Port Hope, including the gravel road to Bewdley, were "in a most disgraceful state". He heard that a company had been formed in Peterborough to gravel seven miles of the Port Hope Road. This would extend about as far as Springville by the 1848 route and the gravel road may have reached this far by 1851.

Stage-wagons were running in summer to Bewdley by 1835 and winter stages were probably started at the same time. In 1851 the land stages still ran to Peterborough only

in winter, the fare being 5 shillings (\$1.00 if Currency). Even in the 1840's some travellers preferred to go on horse-back, in spite of the danger of highwaymen. The son of a Peterborough merchant and mill-owner used to carry his father's money to a bank in Port Hope in this fashion, equipped with one, or perhaps two, pairs of pistols. It is not recorded that these were ever used.

(b) The Hope-Cavan and Emily Road

The petition for the Cavan Road probably suggested the project for a second government road to Cavan. This seems to have been first considered in 1819-20. John Huston, D.P.S., writing from "Cavan 4th Con. Lot 13" on February 23, 1820, asks William Warren Baldwin that he may be appointed a surveyor to lay out the "Great Road between twelve and thirteen in our Township and the adjacent town". Wilmot shows this road on his sketch plan of 1825 as a travelled road beginning at Dundas Street (Highway 2) and running straight north through Hope Township between Lots 14 and 15. Various petitions from inhabitants of Hope Township in 1822-27 concern adjustments in the line of this road which brought its line very much to that of the later county road from Welcome to Perrytown. Wilmot indicates that the road in 1825 ran through Cavan to Emily and beyond that township. In Cavan it probably always ran almost on the line of the county road through Millbrook, Cavanville, Ida and Mount Pleasant.

Some of the money voted in 1831 was to be spent on the road "Through the said Township /Cavan/ between twelve and thirteen...", but there is no indication that other government grants were spent on it in the 1830's or what condition it was in at that period. If the account in "Roughing It in the Bush" is to be accepted, the Moodie family made a detour by this road in 1835, adding about eight or nine miles to the journey from their first home in the west part of Concession IV in Hamilton Township to their bush location near Lakefield.

However, this account, written in Belleville about ten years later, is confused on some points, contains one geographical impossibility and shows signs of both an attempt to heighten its interest and to conceal the position of the locations mentioned. It need not be taken as implying that the usual route to Peterborough led across the Cavan Swamp, or that the Cavan Road was impassable as a winter road in 1835.

This road, through Hope, Cavan and Emily does not seem to have had any distinct name until it became "the West Gravel Road". This gravelling seems to have taken place after 1850. Fleming appears to show it simply as a "principal travelled" road in 1848, and W.H. Smith in 1851 mentions the road without any reference to planking or gravelling. Presumably the gravelling was carried out by a private company in the 1850's. Tremaine, on his Map of Durham County in 1861, shows the road as gravelled to the north county boundary, but marks no toll gates above Perrytown in Hope Township. The County Historical Atlas of 1878 shows a toll gate at the crossing of Concession VIII in Hope Township, but none farther north. The building of the railways did not much reduce the importance of this road, which continued to be used to reach the various stations. Stages were running from Millbrook to Port Hope in 1851 (fare 5 shillings), but seem to have been discontinued soon after the railway was opened in 1857.

(c) The Gore's Landing, Sully, Percy and Alnwick Roads

These early roads of access to Rice Lake lie wholly outside the Otonabee area, but were of great importance during the period of settlement. The Gore's Landing Road was in use before 1820, for in that year an Order-in-Council of December 13 granted John William Bannister, Lieutenant, R.N., a

"...Lease of the Ferry from Lot number sixteen in the ninth Concession of the Township of Hamilton, to any part of the Waters of the Rice Lake, and up and down the Rivers Otonabee and Trent, for the Term of five years from the next Quarter day after this date, at the Annual Rent of One Pound five shillings Currency."

Lot 16, Concession IX in Hamilton, is the site of Gore's Landing. It is not clear whether Lieutenant Bannister continued to avail himself of this rather broad monopoly until December 25, 1826. Some sort of ferry seems to have been in operation in 1822-25, but travellers are sometimes found crossing from Sully (Harwood) as well as Gore's Landing.

Peter Robinson found the road from Cobourg very bad when he crossed it in advance of his settlers in August, 1825. He set about improving it with the aid of some of the immigrants and a grant of £50 from the District. Within a short time he had made it passable for loaded wagons, so that little difficulty was experienced in getting the settlers' goods to Tidy's Tavern. The fact that Tidy had already opened an inn indicates some traffic over the road and ferry, but no regular ferry had been available for some time before April 13, 1827, when Aaron Ellsworth petitioned for the lease, with a recommendation from thirteen magistrates of the District, including Charles Rubidge. Ellsworth pointed out that the ferry would "afford but partial employment & small remuneration" for some years and would require ferry houses on both shores of the lake. He therefore asked that "100 acres of the Town reservation adjoining Captain Anderson's East Line, and 15 acres of North East corner of Lot No. 10 in the 9th Concession of Hamilton" be reserved for the ferry.

The result of this petition was an order of June 8, 1827, for a call for sealed tenders for the lease of the ferry "in the line of communication from Cobourg to Peterborough" for seven years. Whoever rented the ferry at this time eventually had competition of a serious kind. By 1833 the Steamer "Pemedash, Captain Cleghorn" was plying daily between Peterborough and Sully. This gave the Sully branch of the road from Cobourg, probably already open and travelled, increased importance. Fleming shows this road in 1848 as leaving the Gore's Landing Road near Plainville and running

"across Lots" to Sully. The route can still be travelled though it is now less direct; where the road has been adapted to the survey lines, its old line can still be traced by houses built to face onto the old road.

The first proposal for an improved road from Cobourg to Rice Lake was concerned with a "Contemplated plank road", which appears on a plan of part of the Newcastle District in 1833. This seems to have been intended to end at Sully, though a branch to "Claverton" (Gore's Landing) may have been contemplated. A writer describing Cobourg in 1832 remarks that

"An excellent road leads from Cobourg through the centre of the township of Hamilton, to the Rice Lake. A large sum (I believe £600 Currency) borrowed from the bank of Upper Canada, on the responsibility of the magistrate of the division, has been judiciously expended on this road, in the course of the summer. It is expected that the amount of taxes on absentee lands, which is levied next year, will meet the expenditures...It is now proposed to open a branch road from this to meet the Cavan road, near the head of the Rice Lake..."

The branch road may have been opened at this time and is possibly the given road from Plainville to Bewdley, shown as travelled by Fleming in 1848. The attempt to obtain a surfaced road seems for a time to have been pushed into the background by plans for a railway. The steamers on Rice Lake ceased to run after a few years. In "Memoranda on the Plank Road", October 3, 1842, N.H. Baird, C.E., refers to the time "when Steam Boats formerly plied upon Rice Lake". Baird had been asked to report on a route to Peterborough by road and water. His recommended route had been objected to, and in these "Memoranda" he is defending his proposed route against three others. He says that the "present travelled" route was by water from the mouth of the Otonabee to Bewdley and thence by Port Hope to Cobourg. It appears that one party wished for a road to Cobourg from Bewdley and another favoured a more direct route. At this time it seems to have been hoped that the government would make a plank road, and that the inhabitants

of Port Hope and Cobourg were disputing as to its route. In the end the Government of Canada gravelled the Cavan Road, and, in December, 1845, a petition was signed at Cobourg "for the Promotion of the Cobourg and Rice Lake Plank Road and Ferry Company".

The company was incorporated and, in October, 1847, contracted for a large quantity of plank and sills. The work of grading the road was finished by May, 1848, and part was already planked. Sandford Fleming shows it as a plank road, not as a "proposed road", on his map of 1848. He also shows a "Branch to Bewdley" as a plank road. It is curious that W.H. Smith in 1851 mentions this road with its branches to Bewdley and Sully without referring to planking. However, in the same year, Samuel Strickland says the "fine plank road" had cut the stage time from "between lake and lake" to an hour and a half.

Little need be said of the roads through Alnwick and Percy Townships. A reference to a government ferry from Asphodel to Alnwick in 1829 implies some sort of road to the vicinity of McCracken's Landing on Rice Lake, but it is not shown on any early map and its course can only be conjectured.

The road, or roads, through Percy Township led to the "Asphodel Bridge" over the Trent. This was first built in 1825; Richard Birdsall refers to it as existing in January, 1826. It crossed the river a little above Crooks Rapids (Hastings), close to the present railway bridge. It seems to have been destroyed in the spring of 1827 and was rebuilt in that year. Part of the grant made in 1831 was to be spent on the road "From the Percy Settlement to the Asphodel Bridge". This will be the road indicated by Taylor on his map of 1834, running from the bridge through Percy to the Trent in Murray, apparently near Percy Boom.

Taylor shows two roads branching off this one and leading south-west to the Kingston Road in Haldimand

Township; the more westerly one ends near the position of Grafton, the other near the eastern Townline. From the latter he indicates a connection with "Colbourn". Travelled routes from Grafton and Colborne are shown by Fleming in 1848, but he does not indicate the connection with the bridge. This is shown, however, on W.H. Smith's map of 1851, which, like Taylor's, is to some extent diagrammatic but, being larger in scale, gives the line of roads with more accuracy. He mentions in his text roads from Colborne and from near Brighton to "Percy Mills" (Warkworth) and shows a road to the old Asphodel Bridge, but not one to the new bridge at Hastings, which eventually replaced it as the crossing on these routes.

2. Main Roads within the Area

(a) The Chemung Road

This was the first government road wholly laid out in the Otonabee area. As a settlement road, it ought to have been at least cut out by the settlers within a year or two of its survey towards the end of 1818. However, the assessment rolls show that only the southern section of the road was really occupied in the early 1820's and road work on the upper part may have been neglected. The Indian path must, however, very soon have been improved into a road of sorts, if only to allow the families settled along the shore of "Mud Lake" to reach Scott's Mills.

The "Street of Communication" was primarily a portage road, a link in the Trent water communication. After 1830 it formed part of the principal route to the new settlements "up the Lakes". It probably received some slight improvement, but John Langton's various references to it show that it was a notably bad road at that period. He speaks of its succession of mud-holes, and in 1837 provided a pony of Mr. Fortye's for his mother to ride from Peterborough to Chemung Lake, fearing that the jolting of a wagon would be too much for her.

Very few details are available about improvements during the 1840's. There seems to be no record of government spending on this road. The water crossing remained a difficulty. During the mid-thirties the steamer "Sturgeon" plied briefly on Chemung Lake between Bridgenorth and Bobcaygeon. It soon came to grief, and in 1837 travellers were again using small boats. The Colborne District Council made an appropriation in 1844 of £26 Currency (\$104)

"...for the purpose of building a scow and ferry boats on Mud Lake, to ply from Galt's Landing in Ennismore to Edmison's Landing in Smith".

Dr. Poole says that this ferry was given up after a few years.

Some improvement must have taken place, for in 1851 W.H. Smith calls this "a good road" and says it was then intended to macadamize it. According to Dr. Poole:

"In 1854 a Joint Stock Company was formed to construct a gravel road from Peterborough to Bobcaygeon, intending to cross Mud Lake on a bridge..."

The bridge was to be at Edmison's Landing near Bridgenorth. This scheme came to nothing, as did all other schemes for bridging Chemung Lake before 1870. The lake could be crossed in winter on the ice; and in summer, during the 1860's, steamers from Lindsay connected with stages to Peterborough at Bridgenorth. The road appears as an improved road in 1879, with the bridge to Ennismore, which must have been a floating one, closer to the road than the present causeway.

(b) The "Cobourg Road" from Peterborough

Except in Cavan Township, which was at first oriented rather towards Port Hope than Peterborough, the early roads in this area tended to radiate from the Town Reserve in Monaghan. This was, probably, the case before the building of Scott's Mills in 1821. It had nothing to do with the existence of the Town Reserve. The Little Lake was the head of boat navigation on the Otonabee; it was a point where the river could be conveniently crossed - in winter on the ice of the lake, which would remain safe longer than on

the river (then more rapid below the Little Lake than it was later), and in summer by a short ferry from the Indian Landing. Wilmot had shown judgement in suggesting a townsite at this point; the building of Scott's Mills increased the importance of the location and later events confirmed it.

These roads, in most cases, began as trails used by settlers to reach their locations and to come and go from the mills. In several cases they may have had the guidance of Indian paths. Two of these paths are marked on the first plans of Smith Township, drawn by Wilmot in 1818, and part of a third appears on Birdsall's plan of Otonabee in 1819. The first two both started from the landing on Little Lake, dividing a short distance from the shore. One was the portage path to Chemung; the other led up the right bank of the Otonabee to Lake Katchiwano. It kept to the high ground, taking a rather different line in most places from the later road. A short stretch of a third trail is shown starting a little west of Captain Anderson's house on the shore of Rice Lake near Hatrick Point and running north-east between his house and his "improvement" for a mile or two.

Where this trail eventually led to must be a matter of conjecture, but it is not improbable that it was a land route to the Little Lake, avoiding the bends of the Otonabee. There was certainly a passable sleigh route to Captain Rubidge's house early in 1820; for in March he and the Reverend Mr. Macaulay of Cobourg visited the unfinished house in a one-horse sleigh. They had presumably crossed the ice of Rice Lake and it would be natural for them to come ashore at Captain Anderson's and follow the trail marked by Birdsall in 1819 which had, perhaps, been somewhat cleared out by Rubidge's builders and choppers bringing up supplies. There seems to have been a marked sleigh road from Captain Rubidge's to the shore opposite Scott's Plains by the winter of 1822-3. Early in 1823, Alexander Stewart made a trip in

an ox-sleigh to Cobourg, stopping with Captain Rubidge for the night. The sleigh was sent back from Cobourg, as Stewart's stay had to be prolonged, and was to meet him at the Hamilton side of the crossing, where there was as yet no inn. Stewart became impatient after waiting some time for the sleigh. He set off across the ice on foot, lost his way in a snow flurry and wandered about for some time. Luckily, Major Anderson happened to see him and sent a man to lead him to Anderson's house. Stewart waited there until the sleigh came, so it is evident that the crossing usually began near Anderson's, rather than at Lieutenant Bannister's holding at Picnic Point. In recounting this adventure, Mrs. Stewart writes:

"These bush roads do not deserve the name of road, trees fall continually intercepting the track. When any settlers leave home they carry an axe or saw and rope in case of finding such a stoppage and that they may be prepared for any accident."

Later Mrs. Stewart remarks that she cannot visit Mrs. Rubidge as there is a swamp on the way, across which "there is no road". This swamp at about Lots 19 to 21 of Concession XI in Otonabee Township was sometimes under water in summer. When trying to skirt the swamp in the summer of 1824, Sidney Bellingham, a young man on his way to visit the Stewarts, lost his way and wandered in the woods for the better part of two days, spending the night under a tree. Fortunately, he wandered in the arc of a circle (as is common in such cases) and finally reached "a house about two miles the other side of Mr. Rubidges". Mrs. Stewart points out that though there was "a road marked the whole way" young Bellingham did not know "the way people jump and crawl on the logs to get across". The summer route to Cobourg continued to be by river and lake to Gore's Landing or round by the Cavan Road, both much longer than the winter route.

In April, 1824, Mrs. Stewart had expressed the belief that "the new road through Otonabee to Rice Lake" would be finished the following winter. Evidently there had been

talk of this, but it was beyond the means of the few inhabitants and even of the District authorities. The roadwork included in settlement duties was called "opening half the road", but, even where settlement was continuous on both sides and the work was fully performed, it only made a place for a road - an opening through which wagons might be driven with the greatest difficulty. The making of a continuous roadway and its maintenance were normally carried out by the statute labour to which all landowners were liable in person or by deputy. In a new settlement this was quite inadequate to open more than the most essential tracks. Consequently it was the duty of the magistrates in Quarter Sessions to decide which routes should be "established by Law" as roads on which statute labour might legally be employed. These might follow the allowances left in the survey for concessions or side roads (the former partly cut out by settlement duty) or might angle across lots, perhaps following a trail already roughed out by the settlers. When an application for a road was received, in writing or verbally, the road superintendent or the District surveyor (often the same person) examined the line and reported to the District Road Commissioners, who recommended the line to the magistrates (after 1851 to the District Council). The superintendent and township pathmasters were then authorized to apply statute labour or District funds in making the road. The consent of owners whose property was crossed had to be obtained, for once established the road could only be closed by action of the proper authority.

When a main road was in question, further assistance was needed from the Provincial Legislature. Sometimes a road was built by contract by the Province, more often funds were granted to the District to be applied by the Road Commissioners for a specified purpose. The road through Otonabee seems to have been opened as part of the improvements involved in the Robinson settlement of 1825. The immediate

superintendence of the work was entrusted to Captain Rubidge, who, on November 10, 1825, wrote from "Woodland Cottage" to Peter Robinson at Peterborough:

"Dear Sir, as the road is now advancing pretty rapidly towards you and is now ready to be level'd in the neighbourhood of the settlers just located, permit me to request that they may all be warned to assemble on Monday next with spades and shovels..."

Rubidge suggested that "Mr. John Sargent be made foreman as he would benefit considerably by the road" and hoped that "Mr. Stewart will not fail us with his oxen". This Cobourg road was extended into Douro, along the river bank as far as Robert Reid's clearing, so that Alexander Stewart also benefited from the road. The road to Reid's had been cut out sufficiently in November, 1823, for a "cart" to pass over it to the landing opposite Scott's Mills.

This road is said to have passed behind Rubidge's house, running across lots in Concession XI, and then straightening out along the road allowance in front of Concession XII. It was pushed through with special rapidity to prepare for the visit to Peterborough of the Lieutenant-Governor of Upper Canada, Sir Peregrine Maitland. This took place in February, 1826, when the road was presumably finished; but the Governor's sleigh broke down and he had to change to another.

The "Peterborough Road" is mentioned in connection with the expenditures ordered in 1831, but no money was earmarked for it at that time. By 1848 it had been altered to conform to the survey, very much on the line of the present road from Hiawatha to Peterborough. Fleming, however, shows the travelled route in 1848 as beginning on the lakeshore a little west of the "Indian Village", running through the village to Concession X, up that concession and to Concession XI between Lots 12 and 13 and up the front of Concession XI to Lot 19, where it diverts to the north-west and north around the swamp, returning to the concession line at Lot 22. There

is a local tradition that a road once ran from the landing at Campbelltown to the crossroads at Captain Rubidge's up the little valley which extends to the north-east from near the landing. There was certainly a trail to Rubidge's from the landing in 1824, probably opened by him some years before; but in 1848 Campbelltown was approached by a road nearly on the line of the one in use at present.

On his map of 1834 David Taylor shows a short stretch of the road running north from a road from the Asphodel Bridge to the Otonabee River, approximately at Campbelltown, and continuing beyond the river across Monaghan to the Cavan Road. It is possible, therefore, that this is the alternative route to Port Hope described by W.H. Smith in 1851. Smith had been told that this route was shorter and about as good as the Cavan Road.

"The first mile from Peterborough, over a sandy and gravelly soil was very good; after that, however, we found the country but little settled, and the road bad. About half-a-mile before reaching the bridge (ten and a half miles from Peterboro), the road had been graded and freed from stumps, and was tolerably good. With the exception of these two portions the road the whole distance was either hilly, stony or stumpy, with the exception of about a mile of swamps traversed by bad corduroy."

The new bridge had been built in the late 1840's by the Plank Road Company. The distance from Peterborough, and Fleming's Map of 1848, show that it was near the present Bensfort Bridge. Fleming shows a "Proposed Continuation of Plank Road" running from near Hall's Landing across this bridge and up Concession XIII in Otonabee Township to Peterborough. On Baird's Map of the Trent Navigation, 1836, a bridge is marked near this point with an annotation "Toll bridge built by a company $6\frac{1}{2}$ miles from Rice Lake". If this note is, as it appears to be, contemporary with the plan, this route was in use before 1836 and "the new bridge" was a replacement. The planking of this road seems never to have been carried out. It was intended to draw traffic and trade away from Port Hope

to Cobourg. In 1879 the improved "Keene Road to Bridgenorth" used almost the same route as Rubidge's "Cobourg Road" of 1825.

(c) The Road to Keene and Hastings

Dr. Poole says that Captain Rubidge superintended the opening of this road in the mid-1820's and its existence is implied by a reference in 1826. Twenty-five pounds of the Provincial grant of £1,900 in 1831 was allotted to the road "From Gilchrist's Mills to the Peterborough Road". Fifty pounds was to be spent on a road "From Peterborough to Rice Lake in Monaghan", which may be the route described above. If so the Keene Road ran right across Otonabee in 1831, as shown by Taylor in 1834, but the river would then be crossed by a ferry. The road probably always ran mostly straight along the line between Lots 12 and 13 as it did in 1848, in 1879 and 1961. There is no record of this road being gravelled before 1850 and its improvement was probably carried out some years after the organization of Peterborough County. It is shown as improved to beyond Keene in 1879.

The extension of this road to the Asphodel Bridge must have been opened before January, 1826, when the Quarter Sessions of the Newcastle District considered a letter from Richard Birdsall

"...asking for twenty-five pounds towards the building of two bridges on the road leading from the foot of the bridge across the River Trent, on Lot 2 in the 7th Concession of Asphodel, to the mills on the Shaw-quon-a-gaw-Seebee /Gilchrist's Mills/. On this line there are two Rivers, the last mentioned on Lot No. 13 in the 6th Concession of Otonabee...the other the River Ouse on Lot No. 1 2nd Concession of Asphodel".

An order for the £25 was signed by Zaccheus Burnham as District Treasurer on April 14, 1826, and a second for a further £25 "for the bridge over the Shawquonagaw" [Indian River] on July 12, 1826.

The position of the bridge over the Ouse shows that the western part of the road ran much closer to the shore than was possible after the damming of the Trent. This is the

road shown by David Taylor in 1834 and the one for which £75 were allotted from the 1831 grant. The western part evidently became impassable after the building of the Crooks' Rapids Dam in 1837-8. Other roads were no doubt open near the river to replace it; but the maps of 1848 and 1851 show a curious detour leaving the road from Keene to Westwood at the Townline in Lot 3 and running across lots up another road to Westwood to the north-west corner of Lot 7, Concession III, crossing that concession between Lots 7 and 8 and returning down Concession IV to a winding road nearer the shore, but still somewhat north of the old road. In later years this southern route to Hastings seems to have been less used; it was not an improved county road in 1879.

(d) The Peterborough-Norwood Road

The township line between Douro and Otonabee was evidently opened to allow the immigrants of 1825-7 to reach their locations. It was ordered in 1831 that £40 should be spent out of the £1,900 grant "On the Boundary between Otonabee and Douro". Though the boundary between Asphodel and Dummer is not mentioned, it was probably intended for continuing this road to Norwood. This seems to have been regarded as the principal road to Norwood, but must have been neglected, for Fleming's map does not appear to show it as a travelled route in 1848 across Concessions I to X of Otonabee or I to V of Asphodel. Both Fleming in 1848 and W.H. Smith in 1851 show a travelled route from Keene to Westwood (Asphodel Post Office in 1848) using a given road from Lot 14, Concession II in Otonabee, to Lot 10, Concession I in Asphodel, where the line can still be traced, and another given road up the Ouse from Westwood to Norwood, mostly still open and, nearer Norwood, forming part of Highway 7.

Some further government funds may have been spent on this road before 1841, and it is recorded that £335 3s. 1d. were expended on the "Peterborough and Norwood Road"

in 1841-49 by the Government of Canada. However, a memorial from the Peterborough County Council in 1850 says that £300 had been spent on a bridge over the Indian River. As the memorial stresses the importance of improving this road, the bridge may have been the one near Guerin and it is little wonder if the road was in poor condition. The by-laws of the Colborne District make no mention of improvements on the townlines in the 1840's; on the other hand, they record the establishment of a direct road from Norwood through Asphodel and Dummer to the "Marmora Road" across Belmont Township and of roads across Otonabee Township running between Lots 25 and 26 in Concession III and "in Lot 27" across Concessions IV to VII. These were connected with a road still open from Peterborough between Lots 30 and 31 across Concessions XII to X, then by a winding course to Lot 27, Concession VII, to form a route to Westwood, marked "North Road" in 1879 and shown as improved. The eastern part of this to Concession I of Asphodel is now followed by Highway 7. The older "Peterborough and Norwood Road" is also shown as improved in 1879.

(e) The Peterborough and Burleigh Road

There was a wagon road up the right bank of the Otonabee before 1835 at least as high as Herriott's Rapids (Lakefield) and probably as far as Young's Mills. This was the road followed by the Moodie family on a moonlight night in February, 1835. In 1843 a by-law of the Colborne District authorized expenditure "on the highway from the town of Peterborough to Buckhorn Rapids". This Buckhorn Road probably left the road to Young's Point in Concession X of Smith Township, but later a road was made between Lots 24 and 25, Concession VII, to Selwyn and on by the present line to Hall's Bridge.

The Burleigh Road probably corresponded very closely to the present Highway 28 as far as Lakefield. It ran at first nearer the river and below the Indian Path, then followed it across Concession IV, before striking farther to

the north-west on lower ground. An adjustment ordered near "Young's Mill" in 1844 indicates that the road continued to follow the existing road through Smith Township to Young's Point and from there to Burleigh Falls corresponded fairly closely to Highway 28. This was the improved road in 1879, which continued to Apsley and beyond. It passed somewhat to the west of Lakefield.

(f) The Lindsay Road

Some sort of trail must have connected Peterborough with the settlements in Emily and Ops Townships in 1825-27 and there was certainly a sleigh road from Purdy's Mills in the early 1830's. It was, however, rather bad even as a winter road at that time. This route had little importance at first except as a winter road; the settlers in these townships and those up the lakes were more concerned with access to the "front" by the road through Cavan or the Whitby-Scugog Road which was planked in the 1840's. In 1848 a travelled route is shown by Fleming along Concession IV in Smith from the Chemung Road to the Townline at Fowler's Corners and across Emily by "Metcalf" (Omeme) to the Ops Townline, the route now followed by Highway 7. W.H. Smith in 1851 gives a route along Concession II of Smith Township to the Emily Line and up the boundary to Concession IV. Fleming shows this road as continuing along Concession II of Emily to the highway between Lots 12 and 13, forming an alternative route to Metcalfe. The line of Highway 7 is shown as improved in 1879, but no improved route is indicated across Smith on the map of Peterborough County.

(g) The Warsaw Road

The location of the properties assessed in Douro in 1826 seem to indicate that a trail had been opened across the township more or less on the line of the later road to Warsaw. The trail was extended into Dummer in the early 1830's and was probably a travelled road after the

mills were built in 1835-6 if not before. A by-law in 1843 authorized the spending of £10 to repair a bridge and causeway on this road "in the 2nd lot of the 10th concession" of Douro, and another six months later "established" the continuation "through part of Douro and Dummer". The second by-law established a road "from the 12th lot in the second to the 13th in the seventh concession" in Dummer, a continuation of this road in the direction of Centre Dummer; and one of November 11, 1842, had established one "through lots 11 and 12 in the 7 first concessions". By one of these roads there must very early have been a connection with Norwood, but the earlier maps show no roads in Dummer except the road to Peterborough and no improved roads are shown in 1879.

(h) Some Other Early Roads

A direct road from Peterborough to the Otonabee near Wallace Point is shown as travelled by W.H. Smith in 1851, but not by Sandford Fleming in 1848. Neither shows any bridge and the crossing was probably by a ferry. The map of Peterborough County in 1879 shows that this road ran closer to the river across Concessions XVI and XV than the existing road by Stewart Hall, which is shown as unimproved. The road then crossed the river by a bridge at "Williamsburg" (Wallace Point) and had already been altered in several places to conform to the survey lines. A road from Keene to the Town-line of Douro up the front of Concession VI is shown as improved in 1879. It must have been in use quite early as far as "Allandale Mills", but may have branched off up the Indian River to Jermyn by the existing given roads. A road established in 1845 from "the North East angle of lot 20 in the 4th Concession, to the South West angle of lot 18 in the 6th Concession" gave settlers near Fife Hill access to Short's Allandale Mills. It probably made several turns, but may not have conformed exactly to the existing road.

The road from Hastings to Norwood must have existed in some form from about 1825. It is shown as travelled in 1848, but not as improved in 1879. Neither is the road up the left bank of the Otonabee to Lakefield and Young's Point. The latter road is referred to as the "Peterborough Road" in 1843 in a by-law establishing a road from Concession VI in Dummer to intersect it above Selby (Lakefield). The lower part, opened in 1825 almost to Nassau Mills, was evidently closed when the railway was built to Lakefield.

While the main roads were being established in the 1830's and 1840's, more and more roads were being opened along the surveyed road allowances. These are not specially marked on maps and are rarely mentioned in the District and County records, unless divergences or connecting roads were required through private property. Some of the latter were opened to give access to mills, or to provide a shorter and easier route, but when roads between two concessions (for example the road established in 1842 between Lots 7 and 8 in Concession XI of Monaghan) are mentioned it may be assumed that the concessions were open and in use for local traffic. A road opened between Lots 17 and 18 across Concession II of Otonabee in 1842 gave access to Allandale Mills, but one opened at the same time between Lots 17 and 18 in Concession IX was simply intended to allow traffic from Concession VIII to reach the Keene road at Mather's Corners, by-passing the swamp which interrupts the line of Concession VIII.

Some concessions were open very early. The almost continuous occupation revealed by the assessment roll of 1821 along both sides of Concession IV in Cavan Township indicates that this line had been opened as a connection between the two highways and a means of reaching the mills. This may be true also of Concession II as far as Carmel and Concession X to the Emily Road and by that road to Taggart's Mill. East of the Cavan Road settlement was, as the map shows,

more scattered before 1825, and this would combine with the nature of the country to produce roads which ignored the survey lines. A good many of the travelled roads of 1848 follow the pattern of the earliest settlement.

It is plain that by 1850 the area already had an extensive network of roads centering (except for some in Cavan Township) on Peterborough. The condition of these roads, in most cases, left much to be desired even in the 1850's. In the next twenty years, there was a steady improvement, due to an increasing use of gravel on both main and secondary roads. Plank roads proved expensive to maintain and did not survive long into the railway age. It is probable that by the turn of the century most of the roads were fairly good, except at the spring break-up and in exceptionally wet periods. After the incorporation of the Counties and Townships in 1850, the later system of county and township roads came into use. Growing prosperity and population provided a much greater revenue. Provincial subsidies were gradually discontinued and not revived until the present century. Toll roads were often purchased by the counties, though some companies were still in operation to the end of the century. The improvement never kept pace with the desires of the inhabitants and the problem of the spring break-up was not even partly solved until the introduction of underdrained and hard-surfaced roadways after 1918.

With the advent of the motor vehicle the Province again assumed the responsibility for certain highways and the Ontario Department of Highways was established. The paving of highways was begun in 1913, and greatly extended after the First World War. Almost all the improved roads of the 1850's are now surfaced Provincial Highways or County Roads.



LAND

CHAPTER 1

THE CONSERVATION PROBLEM

1. Land Use and Conservation

Conservation has been defined as the wise use of our natural resources. Wise use, however, is a rather incomplete definition. To some people it means hoarding for the future; to others it may mean getting the maximum present returns from these resources.

"The greatest use by the greatest number of people over the greatest period of time" is a definition that expresses thought for the future as well as present use and benefit to man.

Conservation cannot be resource hoarding, nor necessarily the single use of a resource, particularly when applied to land. If the productivity of the soil is being maintained or increased and, at the same time the landowner is receiving a good return for his work and investment, good land use and conservation are synonymous.

Land is valuable to us only as it contributes to human welfare. All our activities need land. We need land to provide food and fibre, to build homes and industries, to lay out transportation routes and facilities, to produce minerals and forest products and for recreation and aesthetic enjoyment.

Some land has qualities that make it suitable for many uses while other areas have only limited use; most land has several possible uses. The value of land normally increases in direct proportion to its number of possible uses, and the demand for its use for various purposes.

In rapidly growing Ontario, the demands for land in many sections are increasing. Frequently it is the best agricultural land that is in most demand for other purposes. When some of the good agricultural land is taken for other purposes, it increases the need to conserve and improve land

elsewhere that will remain agricultural. This is particularly true when such land has a lower agricultural capability.

The best use of land resources involves decisions by both private landowners, and by public bodies and government.

Landowners make decisions about the use of their own land. Farmers must decide on rotations, kinds of crops and fertilizer requirements. Sometimes a decision must be made whether to use land for agriculture at all, or whether it should be reforested, or sold for urban and industrial uses. Such decisions are usually dictated, or influenced, at least in part by economic considerations.

Many decisions regarding the use of land as a result of competing demands on it are made by public bodies - municipal councils and planning boards, and Provincial and Federal Governments. Such decisions are made (1) by official plans, and zoning by-laws (2) by purchase for provincial, national and municipal parks, highways, airfields and other purposes. Government and agency actions have many indirect influences on land use; for example, government policies towards agriculture, location of transportation routes and other developments.

Wise land use, whether on an individual, community, or watershed basis cannot be based, however, on its physical needs and characteristics alone. Land use policies must also consider economic and social aspects. Sometimes indeed one or both of them are more important than the physical.

2. Land Resource Problems

(a) Physical

Before man came to this country, nature had developed her own best uses for the land. White pine grew on the sand plains, hardwoods on heavier soils, cedar and elm in the swamps. Each different soil was producing the kind of growth it was most capable of producing under existing conditions.

As swamps dried up new kinds of vegetation appeared. Forests were replaced with a new kind of tree because the soil's capability to produce hardwoods had been changed.

When man started to use the soil resources of this country, he was not concerned with their conservation. He had little knowledge of, and experience with, the destructive forces of nature in the New World. He had to wrest a living from the land with the simple implements at his disposal and with much hard labour. The practices followed were in keeping with the meagre resources.

The early settler had no information on the capability of the land. This he had to find out by his own experience and observation. We should not now blame our forefathers too much for their mistakes in use and management of the land. All too often later generations have failed to profit by earlier experience.

Slowly we have learned that good land use must be a combination of land capability and man's needs. The soil of a district may be well suited to the growing of a particular cash crop, but if there is no market for that crop, it is useless to grow it.

Basic to any land management program is a knowledge of the physical features and the soil of an area. This can be obtained from careful observation of the soil and its crop response. Many farmers have observed and fitted their farming program to the capability of their land. Other farmers, however, have failed to recognize the needs of their soil and have made little attempt to maintain or improve it.

The need for basic soils information has long been recognized. Both Federal and Provincial Governments in Canada are carrying out soil mapping programs. The Province has conducted conservation surveys in many watersheds in Ontario. Other detailed soil and land-use surveys have been done by municipalities, and by universities. In total, a considerable

amount of information is available on the physical needs and problems of soil and land use. Nevertheless, because of changing conditions continuing surveys are necessary.

Soil and land use information from surveys serves as a basis for government extension programs to encourage better use of the land. Soil survey and conservation reports are available to any landowner who wishes the information. A combination of private initiative and interest, and government support through teaching, extension and research will bring about desirable changes in land use. Changes must be, however, those required by good land management, and by the economic and social problems of the day.

Soil conservation and land management programs are long-range programs. They require the support of every person and every agency concerned with the land.

(b) Economic

The income of any area comes basically from its natural resources, and their availability and use to man. To be economically sound the use of the land and its resources must provide enough income to make the residents financially able to support themselves and provide the various local government services necessary. In Ontario there are many rural, and some urban, areas where this is not possible.

Poor areas are usually poor because of insufficient available resources to support the people living there. Sometimes the resources are present but the people lack capital or knowledge to develop them more fully. Such a situation exists in some parts of Ontario. Residents are attempting to secure a living from land that is marginal or sub-marginal for agriculture. The land may be too poor to produce crops and should be returned to forest or, in some areas, the farming units are just too small to be economic.

In such areas conservation needs may involve a complete change of land use - pasture to forest, or cropland to

pasture. Frequently the landowners cannot afford to make this change. They may not have the initial capital necessary to effect the change or they may not be able to afford a period of lower income during the change period.

In some situations, land uses should be modified to improve rural living standards. This may involve changes to other types of crops, different cultivation methods, or larger farm units.

Taxes, both real and income, have a bearing on land use. Low assessment on marginal land that is capable of improvement may encourage its continued marginal use. Income taxes, and the distinction presently made between capital and income, may influence the use of land. This particularly applies to forestry and woodlot management.

Any Authority program directed towards the use of the land in a watershed, to be effective, must consider the economics of land use. Farmers, just as all other citizens, are working to make reasonable incomes from their operations. It must be demonstrated that recommended land use changes will maintain or increase their income. Some land use and soil conserving measures needed in a watershed may be too expensive to the landowners involved in terms of expected returns. The public, through a Conservation Authority or other agency, must then help bear part of the cost.

Conservation farming makes economic sense. Hundreds of farmers have proved it; nevertheless, those responsible for programs for soil conservation and land use must always be ready to back up their argument with figures. If facts to prove the economic value of recommended measures are not available, it will be much more difficult to "sell" the conservation idea to landowners.

(c) Social

The land should provide the farmer with an adequate income. An adequate income should provide, among other things, a satisfactory standard of living. The use of the land should be suited to the background and experience of the people

concerned. Factors such as the age of the farm operator, his nationality and the opportunities for non-farm employment all influence the pattern of land use.

A farmer that is well past middle age will normally not have the interest or desire to change his farming practices that a younger man will have. This is most true where there are no sons at home to assist him, and eventually take over. Age, or ill health, will prevent a farmer from farming to the best of his ability.

In those parts of Ontario where farm land is marginal, it will often be found that the age of the farm operator averages some years beyond middle age. The younger people, unable to secure what they feel was a reasonable income from these farms, have left for other employment. The parents carry on as best they can until death or retirement.

In recent years, opportunities for off-the-farm employment have increased greatly in almost all parts of Ontario. This is particularly true around larger cities and towns where there are numerous industries. Members of farm families, and often the farm operators themselves have gone to work in urban centres, while continuing to live on the farmstead. The farm land itself may be completely abandoned as an agricultural operation, or there may be partial or seasonal use of the land in combination with the operator's non-farm employment.

The social life of a community can be an important means of promoting a conservation program. Most communities have several organizations - general farm, women's, junior, and church groups and service clubs. A Conservation Authority in promoting its program is well advised to work with these existing organizations in reaching residents.

(d) Political

In our society, government programs can generally only be successful in so far as people want them. This is true at national, provincial or local levels. A conservation program,

whatever its nature, will be successful only if it is needed and is accepted and benefits people.

In Ontario there are several agencies and departments at different levels ready with assistance for conservation programs. This assistance may be technical or financial. Such government departments as Agriculture, Lands and Forests and Commerce and Development aid in carrying out conservation programs. On a local level county and township councils, and river valley Authorities give assistance to local landowners in the use and management of their land.

To be effective, local residents must have a voice in conservation programs. This is provided for through the elections of municipal councils, and their appointment of members to Conservation Authorities. Authority members know the conservation needs and problems of their communities. Further local voice is provided for in the appointment of advisory boards to the Authority. Advisory boards often include members with a special knowledge of land use, recreation, forestry, wildlife or water problems in the area.

It is important in conservation programs, and particularly in land use, that local people always have a voice. They should never be made to feel that a recommendation or a program is "handed down" to them from a higher level. Instead they should be encouraged to discuss their problems and offer their own suggestions.

CHAPTER 2

OTONABEE AND INDIAN WATERSHEDS: GEOGRAPHY

1. Introduction

The region included in the Otonabee Conservation Authority comprises the watersheds of the Otonabee River, Indian Creek, and the Ouse River. The Otonabee Watershed encompasses an area of 365 square miles, the Indian 89 square miles, and the Ouse 144 square miles, giving the Authority jurisdiction over 600 square miles.

The Authority area is bounded in the south by the height of land known as the Oak Ridges moraine, and by Rice Lake. On the east is the watershed of the Crowe River. The northern boundary is a chain of lakes lying along the edge of the rocky Canadian Shield. These lakes include Chemong, Buckhorn, Clear and Stony. Along the west side is the Pigeon River Watershed.

There are thirteen municipalities in the Authority. These are the city of Peterborough (45,300), the villages of Lakefield (2,100), Hastings (900), Millbrook (840) and Norwood (1,100) and the Townships of Asphodel, Cavan, Douro, Dummer, North Monaghan, South Monaghan, Otonabee and Smith. Of the municipalities, Cavan Township and Millbrook are in Durham County, South Monaghan and Hastings in Northumberland and the remainder in Peterborough County.

A number of railways and highways serve the region. Highways include the Transprovincial No. 7 across the watershed, and No. 28 from Port Hope to Peterborough and north into Haliburton. Highway No. 115 to Newcastle and thence to No. 401 brings Peterborough within 90 miles motor distance from Toronto. Both Canadian National and Canadian Pacific rail lines serve Peterborough on through routes. Several branch lines extend into the surrounding area.



Peterborough is the largest municipality in the area. It is the major trading, commercial and manufacturing centre for the surrounding counties. Lakefield is the largest other urban community. It is located some 10 miles north on Highway 28. It is the centre for a particularly thriving tourist trade. Norwood and Hastings Villages are also tourist trading centres.

2. Hydrography

The Otonabee River has its source in Katchawana Lake, at Lakefield. It flows in a generally southerly direction through Peterborough. It empties into Rice Lake at a point about 6 miles from the lake's south-western end. There are four major tributaries of the Otonabee - Jackson, Cavanville, Baxter and Squirrel Creeks. They all arise in the high land on the western border of the watershed and flow east to the main river.

The Indian River flows from Stony Lake and Dummer Lake south to Rice Lake, entering it south of the village of Keene.

These two rivers are part of the Trent River system, which is Southern Ontario's largest. The whole Trent system drains an area of over 5,000 square miles. For a short time during the Lake Algonquin period of glacial history, the Trent River was an important drainage way for the Upper Great Lakes.

The Otonabee and Indian Rivers drain a series of lakes, commonly called the Kawarthas, which include Sturgeon, Pigeon, Stony, Clear and Buckhorn into Rice Lake. This lake in turn flows into the Trent River and hence to Lake Ontario.

The lakes forming the north boundary of the watershed are roughly located along the edge of the Canadian Shield to the north. They were likely formed by glacial action, as they roughly parallel the apparent direction of ice movement. Rice Lake occupies part of a pre-glacial valley.

The Otonabee River flows a length of 35 miles with about 100 feet of fall. The Indian River is about 24 miles long with 150 feet of fall.

3. Physiography

A knowledge of the physiography, or surface relief of a watershed, is helpful in understanding the soils and the problems associated with their use.

Land features of most of the upper part of this continent are chiefly due to the actions of great glaciers. These glaciers once covered whole portions of the continent. They acted as tremendous forces of erosion and deposition; they helped to shape our landscape.

A million years is a relatively short time, geologically speaking. During this time most of Canada has been covered at least four times by great sheets of ice. It has been estimated that in some places these great continental ice sheets were at least two miles thick. These glaciers emanated from two principal centres in the north - the Keewatin district, and the highlands of Labrador and Quebec. They were likely the result of climatic changes; changes which caused the ponderous ice flows to move across the face of the northern hemisphere and recede again. Between the several ice ages there were long periods when the climate was warm, probably warmer than now and the land was ice free.

The last great glaciation is commonly called the Wisconsin, because its results were first identified in that state. It was responsible for much of our present landscape. As it spread out from Arctic regions, its movement may perhaps be compared to the spreading out of a spoonful of pancake batter as it is poured in a pan. As this great continental ice sheet moved forward, it acted as a plough, pushing, scraping and grinding the underlying bedrock and surface deposits. The resultant material is a conglomerated, heterogenous material called TILL.

During its lengthy advances, warmer weather sometimes caused temporary recessions in the glacier, when parts of it melted. One can only imagine the fantastic amounts of water released. These meltwaters, rushing away from the melting face of the glacier carried with them large amounts of loose rock. This rock was later deposited when the volume and velocity of water decreased. Materials deposited in such a manner are said to be "glacio-fluvial" ("glacio" referring to the rocks being pushed about by the glacier, and "fluvial" to the fact that this material is water moved).

Rock materials were often carried great distances from their point of origin. The moving ice also gouged out great rock fragments which scraped at the rock floor over which they were being carried. Sharp corners and edges of even the hardest rocks were ground smooth by this abrasive action. Thus were formed the rounded and smoothed rocks and stones common to glaciated regions, and so common in many parts of Ontario.

(a) The Otonabee Region Watersheds

Two major ice lobes were responsible for the present landscape features of south-central Ontario. One of these advanced from the east into the basin of present Lake Ontario; the other came down from the north. These two lobes met a few miles north of Lake Ontario. Between these two advancing lobes was pushed up a ridge or MORaine which runs in an east-west direction. This ridge is commonly called the Oak Ridges moraine. It starts at the base of the Niagara escarpment, in Peel County, and runs east through York, Ontario and Durham Counties, to end near Rice Lake. It forms the height of land dividing drainage south into Lake Ontario from drainage north into Georgian Bay, Lake Simcoe and the Trent River system.

The Oak Ridges moraine gives rise to a number of major tributaries of the Otonabee River. Jackson, Cavanville and Baxter Creeks arise in it, and flow east or north-east.

LEGEND



It is believed that the north lobe of the last glacier made one final advance before its complete recession and overrode the Oak Ridges moraine. In its path it left the many hills, or drumlins around Peterborough.

There are four major physiographic divisions of the watersheds. These are (1) the Oak Ridges moraine (2) the Peterborough drumlin field (3) the Dummer moraine and (4) the Schomberg Lake plain. These major areas, shaped by glacial action thousands of years ago, have given rise to the various soil and land types of the watershed.

(1) Oak Ridges Moraine

This moraine, or ridge, forms the southern boundary of a part of the watershed. It separates southern drainage by the Ganaraska River, from the land drained north and east by Jackson, Baxter and Cavanville Creeks.

The highest land in the Authority area, at an elevation of some 1,200 feet is found on the moraine in Lot 2, Concession XI, Cavan Township. At many points the moraine elevation ranges between 1,000 and 1,100 feet.

The soils of the moraine are mostly sandy or gravelly. This fact, together with the sharply hilly topography, has led to severe erosion in some spots and extensive areas of moderate erosion. Both wind and water can cause erosion in these soils. Most of the land in the moraine is susceptible to varying degrees of erosion. It should be cultivated with the use of erosion-controlling measures such as long rotations of grass. Large areas of the moraine in the headwaters of the Ganaraska River have been reforested.

(2) Peterborough Drumlin Field

The area about the city of Peterborough and to the east and south of it is characterized by many low, oval, elongated hills. These are known as DRUMLINS. In shape they are rather like the inverted bowl of a spoon and are often called "whale backs".



This long, low, sinuous ridge just north of Warsaw is called an esker. Such ridges are often a source of gravel.



One of the many low whale-back hills called drumlins. This drumlin in Otonabee Township is typical.



Low areas between the drumlins are usually poorly drained. This view is from the crest of a drumlin.

As the glacier passed over this area, it moved huge mounds of rock debris about. Some of the material became plastered onto the bedrock in a thick layer. It ranged in size from fine clay to large rocks. Such material is called TILL. This material gives rise to the varying kinds of soil in this area.

Drumlins have been formed on this area in a manner not yet clearly understood. It is believed, however, that the advancing glacier overrode some impediment. The soil and rock material being carried on the lower part of the glacier became plastered against this impediment, slowly building up the oval-shaped hill. Drumlins usually all face in the same direction indicating the direction of movement of the ice.

The drumlinized area in the Otonabee Watershed is one of the most distinctive in Ontario. It is called the Peterborough drumlin field because the city is in the midst of it; there are in fact several drumlins within the city itself. Probably the one on which Ashburnham Park, in the east part of the city, is located, is the best known. Early writers described Peterborough as being built on seven hills.

Drumlins vary in dimension, but average about 75 feet in height, a quarter-mile wide and up to a mile long. They are closely spaced, averaging four or five per square mile. The low-lying land between the drumlins may be poorly drained or even swampy.

The soil on drumlins in this area is usually reasonably fertile. It is frequently quite stony, as indicated by the many stone fences, and piles in mid-field. The most commonly occurring soil is Otonabee loam. It is a loam, or clay loam soil, often stony and high in lime. Other types are found, particularly between the drumlins.

Agricultural use of drumlinized areas presents many limitations, imposed by steep slopes, stoniness and poorly drained inter-drumlin hollows. The steep slopes on the sides of

drumlins make characteristic up-and-down-hill cultivation difficult and an erosion hazard. In the Peterborough area, the land survey pattern makes the roads, and hence the fences, cross the drumlins at an angle of 45 degrees. This makes across-the-slope cultivation difficult without removal of fences.

The stoniness of drumlin soils has often inhibited cultivation. A few of the steeper slopes have never been cleared of wood cover. The low-lying land between the drumlins varies in its drainage condition. Some is cultivated; some has been drained by tile; a large number of low areas are used for permanent pasture or woodlot.

(3) Schomberg Lake Plain

South and west of Peterborough, running as far as the villages of Millbrook and Cavan, is an area once occupied by a small glacial lake. This lake was once part of a much more extensive area covered by water. This water was caught, just prior to the final retreat of the last glacier, between the Oak Ridges moraine to the south, and the retreating ice mass to the north. This water-covered area, which extended to Lake Simcoe, and west as far as the village of Schomberg, in York County, has been named the Schomberg Lake plain.

Glacial meltwaters, pouring into the lake, carried in soil material which settled to the bottom in the quiet waters of the lake. This has given rise to soils called LACUSTRINE because of their water-laid origin. Such soils may be fine clays, sands or silt. The sands were washed in from the Oak Ridges Moraine.

The swamp to the west of Peterborough, in the north end of Cavan Township, and locally called Cavan Bog, is a residue of the glacial lake.

Soils common to the area are loams - clay or silt. Schomberg, Otonabee and Bondhead loams are well drained. There are smaller areas of imperfectly or poorly drained soils.

(4) Dummer Moraine

In the north-east part of the Authority area, east and north of the village of Warsaw, is a region of rough stony land bordering the Canadian Shield. It extends from the Kawartha Lakes eastward into Hastings County and the Crowe River Watershed. Because this land is typical of Dummer Township, the name Dummer moraine has been applied to it.

The general topography of the area only varies within elevations of about 75 feet; it is relatively low. Nevertheless it is quite rough. Most of it is very stony and the soil is usually quite shallow. There are many areas of exposed rock.

Clear, Stony and Buckhorn Lakes are examples of the long, narrow lakes associated with the rivers that drain this area. There are numerous swamps through the area.

Much of the area has been cleared, and occupied for agriculture. Most of the cleared land is used for pasture, although some fields have been cleared of stones and grow grain. The main agricultural limitations of the soils in the Dummer moraine are stoniness and shallowness. The shallow soils tend to be quite droughty. Their rough bouldery nature presents many problems in land management. The better areas of the moraine are best suited to pasture. Some farmers are producing good pastures; others could profitably improve theirs. Extensive areas should be returned to tree growing.

For a more complete description of the physiography of this part of Ontario the reader should refer to the publications - "Physiography of Southern Ontario"* and the "Surficial Geology of the Lindsay-Peterborough Area"†.

* Chapman, L.J., and Putnam, D.F. "The Physiography of Southern Ontario" University of Toronto Press, 1951.

Gravenor, C.P. "Surficial Geology of the Lindsay-Peterborough Area, Ontario, Victoria, Peterborough, Durham and Northumberland Counties, Ontario". Geological Survey of Canada, Memoir 288, 1957. Queen's Printer, Ottawa.

CHAPTER 3

SOILS

1. Factors in their Formation

Soil is the medium in which plants grow.

It is found more or less continuously over the land surface, except at polar regions, and in the mountains. Soil forms the link between the earth's rocky core and life upon its **sur-**face.

Soil develops from broken-down rock and mineral material. In Ontario this break-down was started by glacial action and completed by various weathering processes - wind, rain, sun, frost. The rock material becomes mixed with organic matter supplied by decaying plant and animal material.

The parent rock material, together with organic matter, air and water are the "building blocks of soil". The proportion of each varies from soil to soil. This is the basis of soil differences. These differences are expressed not only in soil qualities, but in their ability to support plant life.

Most soils are made up of layers. These layers are called HORIZONS. Taken together, these horizons are called the SOIL PROFILE. A soil profile can be described as a vertical cross-section cut to the weathered and unaltered parent material from which the soil was formed.

Examination of a profile can tell the story of the centuries of development behind that particular soil; its examination is basic to any scientific soil study.

Such influences as type of bedrock, climate, slope, vegetation and drainage enter into the formation of a soil profile. The horizons of a profile may be thick or thin. Their colour may vary. They can be likened to the layers of a cake without the frosting between them.

For the purposes of description soil horizons have been given letters. The main horizons are designated as

"A" "B" and "C". Some soils may lack one or more horizons. The main horizons are subdivided into A1, A2, etc.

The "A" horizon is the uppermost layer of the profile; it is the surface or topsoil. Life is most abundant in this layer and most of the organic matter is formed in it.

Immediately below the "A" layer is the "B" horizon, commonly called the sub-soil. It has less life, e.g., plant roots, bacteria, etc., than the "A" layer.

The "C" horizon is the deepest layer. It contains the rock material from which the layers above have **gradu-**ally been formed. It is therefore called the parent material. It contains little living matter, and is often lighter in colour than the "A" and "B" layers.

Soil formation is a long-drawn out process. It starts with the break-down of rocks by weathering, chemical reaction and other agents. Rock is broken into small pieces, which in turn become still smaller, eventually becoming the particles of mineral soil. Dead and decayed plant and animal material, or organic matter becomes mixed with the upper layers to form topsoil.

There are many differences in soils. They can differ within a field, on a farm to farm basis, or from county to county. Their differences are the basis of soil classification and description.

2. Soil Surveys

Just as plants and animals can be named and classified, so can soils. In plants, characteristics such as leaf and flower are used to identify them. In soils, such factors as texture, stoniness, colour, number and depth of horizons, drainage, topography and vegetation are used to identify, describe, name and map them.

Knowledge of the soil, its properties and limitations, is basic to any conservation program. Every farmer

knows whether his soil is sand or clay, poorly or well drained. However, a more scientific designation and description is often necessary. Such information is obtained by means of a soil survey.

Essentially, the purpose of a soil survey is to set up an inventory of the soil resources of an area. In Ontario, soil surveys are carried out on a county basis. They are conducted co-operatively between the Soils Research Institute of the Canada Department of Agriculture and the Ontario Agricultural College's Soils Department.

A soil survey includes fairly detailed examination of all the soils in the county. They are classified into various units; boundaries of the units are mapped and full descriptions made of the various kinds of soil. Field mapping is done, usually on aerial photographs. Later, maps are drawn, and descriptions written for the county report which is published following the survey. These soil reports consist of descriptions of the soil, together with some suggestions for their use and management. Each is accompanied by a map showing location and distribution of each soil.

The soils of any area may be grouped according to the kind and origin of the parent material. These parent materials are derived from the bedrock. When soils are formed from the same kind of bedrock, they are certain to have many similarities. The parent material will likely have been worked out of the bedrock by action of glaciers.

Where a group of soils has been developed from the same kind of bedrock and parent material, they may possess similar layers or horizons. Such a group of somewhat similar soils is called a "soil series". The series is the main unit of soil classification. Each series is given a name - often the name of the township or place near which it was first mapped. Thus a predominant soil series in Peterborough County is the Otonabee.

Within a series the topsoil may have different textures depending on the many factors governing its development over the thousands of years. Thus we may have sand in the topsoil giving a sandy loam, e.g. - Otonabee sandy loam. Soil differentiation based on topsoil characteristics is called a soil type.

Soils may have developed from the same parent material, but have been subjected to different drainage conditions during formation. This can have a great bearing on their development, as can also the amount of slope. Depending on the kind of slope or drainage, they may form different profiles. Differentiation on this basis is called a catena. Thus we may have a well, imperfectly or poorly drained soil developed from the same parent material. But drainage will have significantly affected their qualities and characteristics.

In mapping and describing soils several terms are used in their description:

"Calcareous" - Soil containing sufficient quantity of lime to be alkaline.

"Humus" - well decayed part of the soil's organic matter.

"Structure" - arrangement of individual soil particles into larger units, e.g., sand, which has a single grain structure, or when many particles adhere to give the cloddy structure of clay.

"topography" - refers to the "lay of the land" i.e. - flat, or rolling.

3. Major Soils of the Watersheds*

The classification of soils is based on the method of deposition of the parent material from which they were

* Material in this section taken from "Soil Survey of Durham County", Report No.9, 1946; and from the Soil Map of Peterborough County (available only in photostat).

formed. Chapter 2, dealing with the physiography of the watersheds, has described the main physiographic regions. These were the Oak Ridges moraine, the Peterborough drumlin field, the Schomberg Lake plain, and the Dummer moraine. The soils of the area were developed within these regions from conditions imposed by action of the ice.

(a) TILL Plains - the Peterborough Drumlin Field

Till is that part of the parent material deposited by and underneath the ice. It is usually an unconsolidated heterogeneous mixture of clay, silt, sand, gravel and boulders. Because of this mixture, till can rise to a variety of soils. Over a large part of the watershed, till is derived from limestone bedrock.

The most distinctive feature of this till "plain" is the Peterborough drumlin field. These drumlins, described in Chapter 2, are closely scattered through the area around Peterborough.

The materials within the drumlin are commonly till. Boulders and numerous small rounded stones are well mixed through the clay loam.

The most important soil in this till plain is Otonabee. Indeed it is the most important agricultural soil in the whole Authority area, occupying nearly one-half of the area surveyed.

Otonabee is generally a loam, although in a number of areas, the surface texture is sandy loam. It sometimes tends to be quite stony. It is high in lime, and usually well drained.

Otonabee soils are used for mixed farming. Pasture, hay and grain are grown for the livestock, mostly beef, carried on most farms. Some of these soils, located on steep drumlin slopes, are subject to erosion, and their steepness makes cultivation difficult. Such slopes should be kept in permanent pasture, or planted to trees.

About 5 per cent of the area of till plain is Bondhead soil, either loam or sandy loam. Bondhead is found in small areas in Cavan, North and South Monaghan Townships. Bondhead soils are well drained, sometimes stony. They are usually rolling and make good soils for general farming - dairy-ing, beef, grain, hay and pasture.

In the north-east part of the area watersheds is the Dummer moraine. A line running roughly from Lakefield through Warsaw to Norwood divides this area of shallow soils from the deeper tills of the drumlinized area.

The most common soil is Dummer loam. It occupies much of this region. Dummer is formed from very stony till, and is excessively well drained. The chief limitations of Dummer soil are shallowness and stoniness. Both inhibit cultivation. Where they have been cleared, fair crops are produced, but the occasional outcrops of bedrock, the many stone piles and stone fences, indicate the stony nature of the soil. Dummer soil is best used for pasture or forestry.

Farmington loam is also found in the Dummer moraine. It is very shallow, less than one foot of soil over limestone bedrock. It, like Dummer, is best suited to pasture or forest production.

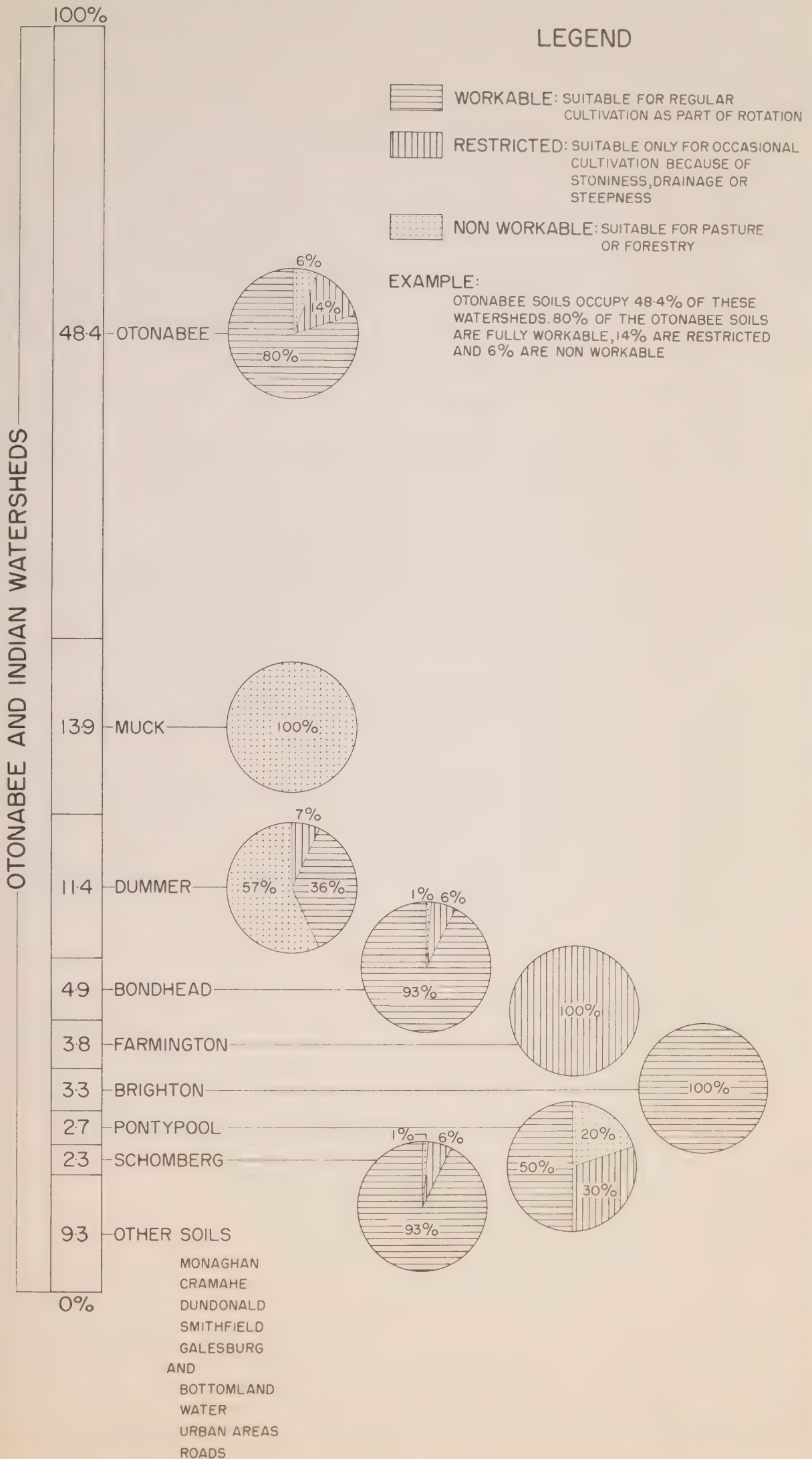
(b) Soils Developed from Lacustrine(water-laid)Material - The Schomberg Lake Plain

An area north of the height of land, and running west across central Ontario was once covered by a glacial lake. This is described in Chapter 2. Where this lake occurred, fine-textured deposits were laid down in the still waters. The most important lacustrine deposit is Schomberg.

Schomberg is found in Cavan Township and adjacent North and South Monaghan. Schomberg is a well drained clay loam or silt loam, nearly stone free. The undulating slopes of Schomberg are susceptible to sheet erosion, and control measures such as long rotations are needed. This soil is high in lime and well suited to clovers.

OTONABEE REGION WATERSHEDS

MAJOR SOILS AND THEIR WORKABILITY



(c) Outwash Sands and Gravel - the Oak Ridges Moraine

This area is located along the height of land, known as the Oak Ridges moraine, which forms the south boundary of the Otonabee Watershed, west from Rice Lake. The soils are usually assorted sands, gravel and till.

Brighton sand, and Pontypool sand are the most common soils in this area. Small deposits of Brighton sand are found in parts of the watershed, chiefly around Millbrook. They are well drained with gentle to moderately-sloping topography.

Pontypool sand is found along the height of land in the south and west of Cavan Township. Scattered small deposits are found elsewhere throughout the watershed. Pontypool is a well-drained sand or gravel, hilly to rolling in topography. The light soils are susceptible to erosion; this, along with their steep slopes, limits them for agriculture. Some of the Pontypool sand is used for tobacco growing; extensive areas have also been reforested.

(d) Organic Soils - Muck and Peat

Extremely poor drainage conditions cause formation of organic soils. These may be either peat (undecayed organic matter) or muck which is the more completely broken down remains of trees, shrubs and plants.

Several rather extensive areas of organic soils occur in the watershed. Cavan bog, located in the north of Cavan Township is an area of 2,840 acres. Another area several miles in length is Buckley Lake swamp. None of the muck areas has been used for agriculture; they are all covered with tree growth or other woody vegetation.

The above paragraphs have briefly described the main soils of the watersheds; there are a number of others found in small areas and quantities. These include Cramahe, Dundonald, Smithfield and Monaghan.

4. Land Capability

Soils inventories and soils maps are basic tools in developing any system of land management based on soil and



The pasture potential of this Class VII land is very low. This stony land in Dummer Township should be used for forestry.



Class VI land in the north east part of the watershed can produce some pasture if used very carefully.



Class IV land in Smith Township growing good pasture.

water conservation. Soil conservation implies soil maintenance and improvement; this is the ultimate goal of soil management.

Given the information collected and published in soil surveys, and the data from conservation surveys, one has most of the basic information needed to manage, or advise on the management of any soil area. In order to better use this information in terms of describing the production potential of a parcel of land, a land capability classification system has been developed. This system has been developed by the Soils Department of the Ontario Agricultural College, and others interested in land classification. The system is based on one developed by the Soil Conservation Service of the United States Department of Agriculture.

Land classification helps to organize all the soil facts of significance for conservation use. It is known as the "Land Use Capability Classification", the term "capability" referring to the hazards and limitations inherent in a piece of land.

Land capability classification is based on the soil map and such information as topography, slope, drainage, freedom from stones and erosion susceptibility.

To classify land, eight divisions, or classes are used. They are numbered from I to VIII. Soils that can be used in the same way, and that will give about the same crop yield, are grouped into one class.

Classes I to IV are suited to cultivation; classes V to VIII are not generally suited to cultivation and are most useful for pasture, woodland or wildlife and recreational uses.

Capability Classes

A. Land Suited for Cultivation

Class I - consists of land with no, or very slight, limitations to its use. Class I soils are level, deep, well drained and easily worked. They are not subject to erosion or flooding. They are suitable for intensive cultivation without special management measures.

Class II - is made up of land subject to moderate use limitations. These are good soils that can be cultivated with a few easily-used conservation practices.

Soils of this class may have up to 6 per cent slope, be moderately susceptible to erosion or need drainage. They are generally stonefree. Such management practices as soil conserving rotations, grass waterways or tile drainage may be needed.

Class III - is land subject to a number of cultural limitations. Such land may be subject to erosion, have slopes up to 12 per cent, be quite stony or shallow. These limitations often restrict the choice of crops or tillage. Nevertheless Class III land is moderately good land which can be regularly used for crops with proper management.

Class III land requires cropping systems that provide adequate soil cover. Management measures needed are long rotations, including sod crops, contouring and strip-cropping, grass waterways and artificial drainage.

Class IV - is composed of soils with severe permanent cultural limitations or hazards. These soils may be cultivated occasionally with great care. Generally they should be in permanent grass cover.

Class IV soils are subject to such limitations as severe susceptibility to erosion, shallow or infertile soils, poor drainage which cannot be corrected easily, steep slopes, or excess stoniness.

B. Land Not Suited to Cultivation

The soils in the last four land classes are not suited to cultivation, but should be kept in permanent cover.

Class V - This class has few limitations for permanent vegetation. Cultivation is not possible because of wetness or stoniness. In this class are muck soils, bottomlands along river courses, and level stony soils. Under permanent vegetation - pasture or forest - class V lands may be used without limitations.

Class VI - consists of land subject to moderate permanent hazards to their use for pasture or woodland. They may be subject to erosion, be stony, shallow or steep.

Woodlots should be fenced. Pasture use should be adjusted to carrying capacity or season.

Class VII - These soils are severely restricted for forestry or pasture. They may be very steep, severely eroded, swampy, arid blows and/or very shallow with rock outcrops.

Class VII lands have many limitations for pasture or forestry. Mostly, they should be in permanent forest cover. Some may have value for recreation or wildlife.

Class VIII - This class is made up of land that is too rough even for grazing and forestry purposes. Areas such as extremely rough, barren land, or undrainable marshes come in this class. Such lands are best suited for wildlife or recreation.



The lower slopes of this drumlin are growing alfalfa. Class IV and VI land on the steeper slopes on top are kept in tree cover.



Well drained Class III land growing hay and oats.



A small area of Class I land in Smith Township, north of Peterborough.

CHAPTER 4

CONSERVATION SURVEYS

During the summer of 1960 a conservation survey* of the Otonabee and Indian Watersheds was carried out by the Department of Commerce and Development. This survey dealt with conditions of renewable resources - water, soil, forests, wildlife and recreation. The land survey was concerned with the various soils and their uses, conditions and problems.

Basis for the land surveys was the topographic maps for the area and aerial mosaic photographs. The former were in a scale of 1:50,000, the latter at 1 inch to 1,320 feet.

The county soil reports and maps were used to provide information on the soils of the region. The conservation survey mapped erosion, drainage and topography and such other significant data as farm ponds, flood plain land, gullies, etc. The existing use of the land was also recorded. Field mapping was done on the aerial photo mosaics.

Time did not permit a complete land survey of the Authority area; therefore a sample area was picked. This was done on the basis of the "blocks" created by the township survey grid of lots and concessions. Concession roads and side roads provided block boundaries. About one-quarter of the blocks in the Authority area were selected in a random manner and surveyed. These 70 blocks with a total area of 75,000 acres represent just over 25 per cent of the Authority area.

This selection, more or less at random, of blocks through the watersheds provided a representative sampling of land conditions. To obtain more information on specific sections, more detailed surveys were carried out in 4 areas. These were (1) Cavan Township (2) Cavan bog (3) Drumlinized till plain - some 22,000 acres of the drumlan area east of Peterborough (4) the area surrounding the City of Peterborough.

* The Ouse River Watershed was not voted into the Otonabee Authority until March 1961; it was, hence, not included in the survey, and statistics for the Authority area include only the Otonabee and Indian Watersheds.

The special survey of Cavan bog is reported as Chapter 6 of the Land Use report.

1. The Authority Area as a Whole

Physiography and major soils of the part of Ontario in which the Otonabee and Indian Watersheds are located are described in preceding chapters.

Graphs and charts accompanying this section describe land conditions in the area under - (1) major soil types and their workability, (2) Land Capability, (3) Erosion, (4) Drainage, (5) Topography.

(a) Present Use

For purposes of the survey, land use was recorded under four major divisions - cultivated, hay-pasture, woodland and unimproved pasture.

Cultivated land, as mapped, included only that land that was actually under cultivation, i.e. growing grain, rowcrops or in fallow at time of survey. There was 16.5 per cent of the area in this category, including about 0.5 per cent rowcrops, mostly ensilage corn. There is an area of vegetable growing on the south edge of Peterborough, along the Otonabee River. Some tobacco is grown in the Pontypool sandy loams in the south part of Cavan Township.

For the most part, the cultivated land was growing fall wheat, spring grains - oats, barley and mixed grains, and scattered fallow fields.

Hay and pasture land accounts for over 25 per cent of the land use. Included in the category was land normally cultivated as part of the farm rotation, but which was under grass cover in 1960. It was not possible in the early part of the season to differentiate between hay and pasture. Pasture in this category included only "improved" pasture.

Unimproved pasture included 22 per cent of the area. It comprised land on which either no effort at cultivation had been made or cultivating was not possible. Included

here was extensive acreage of the Dummer and Farmington soil types, low-lying wetlands, and the steep slopes of Darlington, Bondhead and Pontypool soils. Land with less than 50 per cent wood cover was described as unimproved pasture; over 50 per cent wood cover, even where pastured, was included in woodland.

Hay and pasture, together with cultivated land, make a total of just over 41 per cent of the area under regular rotation.

Woodland comprises over 30 per cent of the watersheds, and is the largest land use category. Included in woodland is a small acreage of less than 1 per cent that has been reforested.

The Forestry section of the Conservation Report describes the woodland in detail.

The remaining 7 per cent of the land area was in such uses as urban, roads, non-farm rural, and water (including streams and inland lakes and ponds).

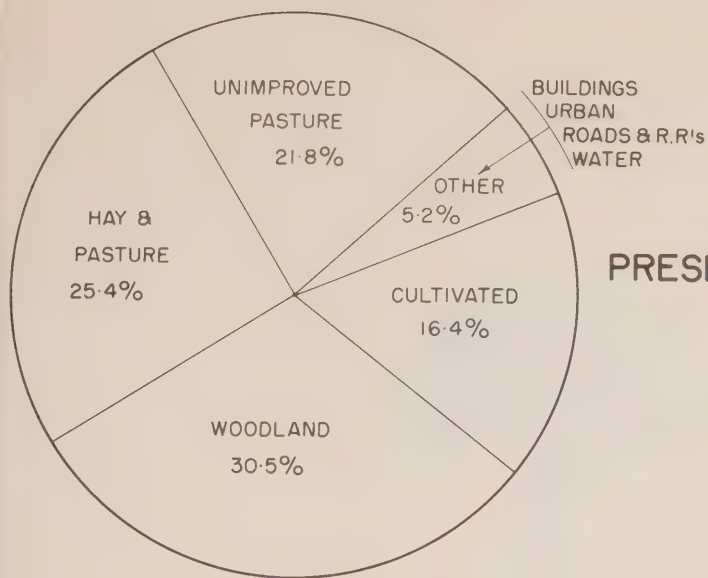
(b) Land Conditions

(1) Slope

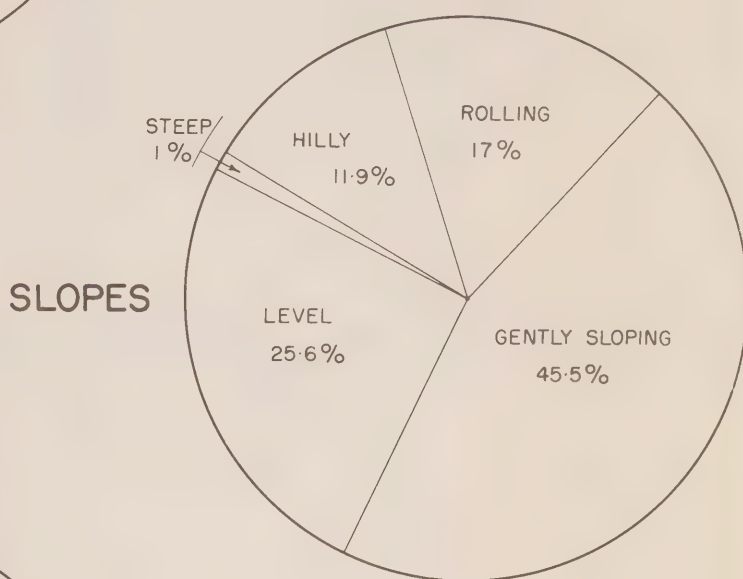
The amount and degree of slope that exists has a major bearing on the capability of a piece of land. For that reason, slopes were mapped during the survey. In the sample blocks over the watershed some 8 per cent was mapped as level, with slopes not exceeding 2 per cent. Gently sloping, with slopes not exceeding 6 per cent, accounted for over 40 per cent of the area. Rolling land, with slope range of 6 per cent to 10 per cent occupies 15 per cent of the area while hilly land (10 per cent to 25 per cent slopes) and steep (slope over 25 per cent) accounted for 10.7 per cent and 0.06 per cent respectively.

Steepest slopes are found on the Otonabee and Pontypool soils. The many drumlins account for the steepest slopes of Otonabee soil. Mostly, the slopes are short, and

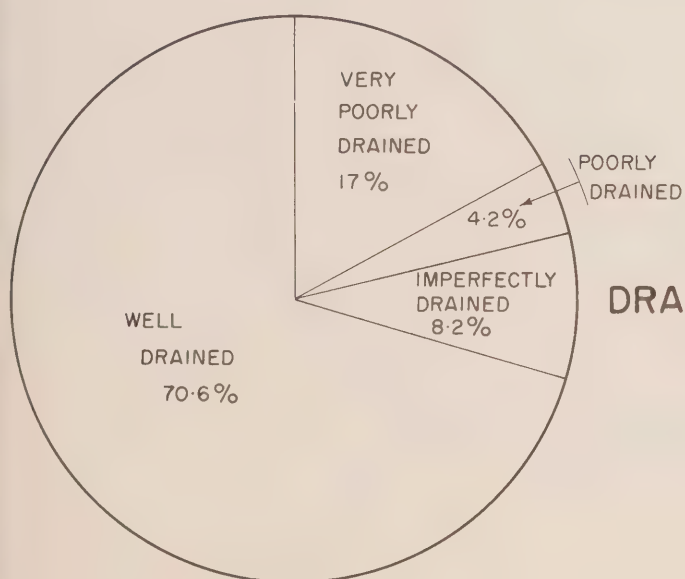
OTONABEE REGION EXISTING LAND CONDITIONS IN THE AUTHORITY AREA



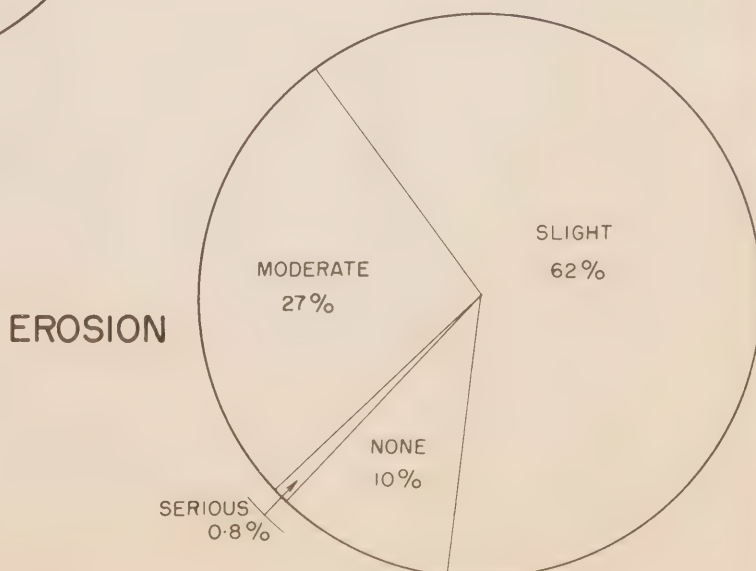
PRESENT LAND USE



SLOPES



DRAINAGE

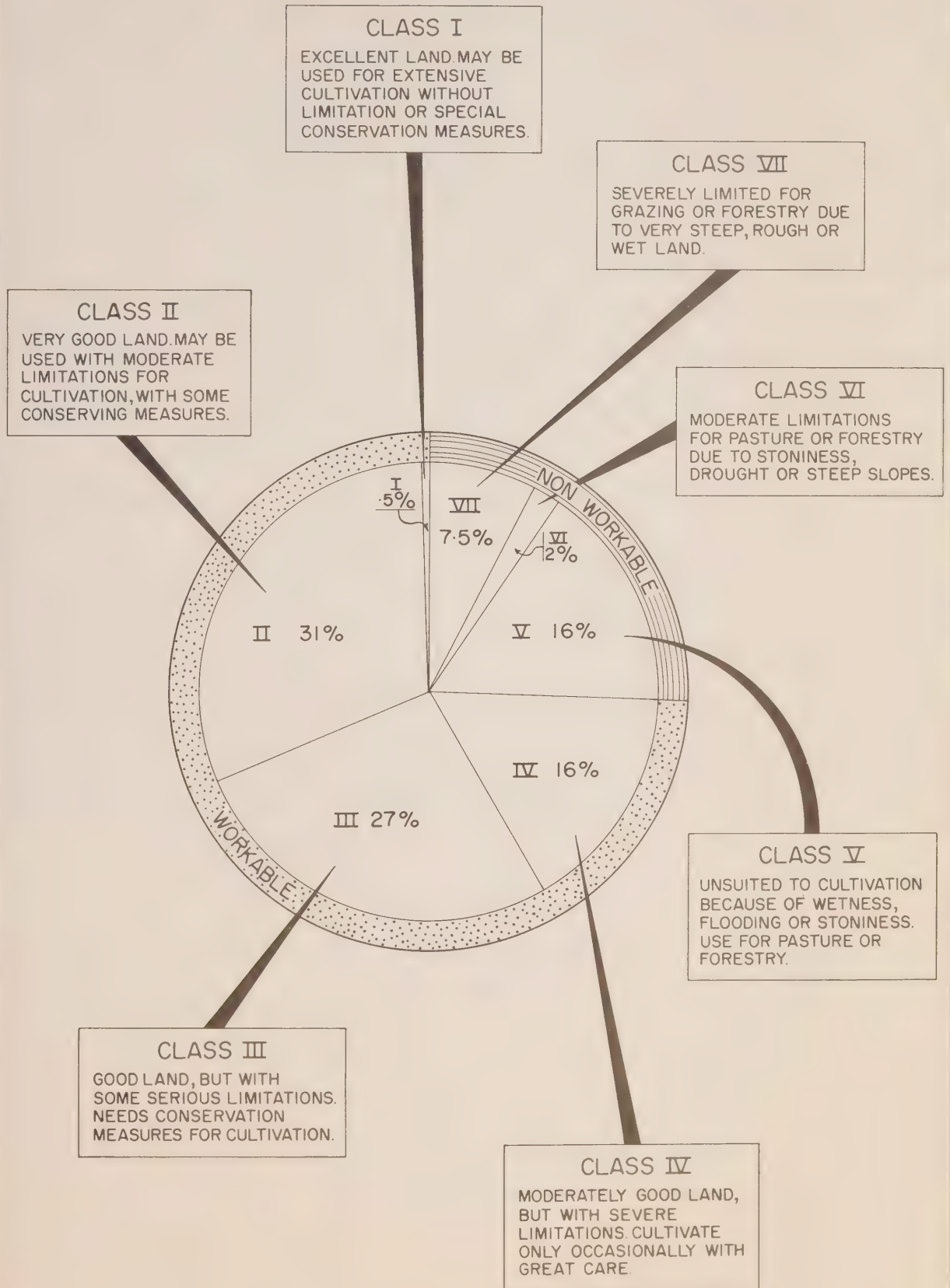


EROSION

OTONABEE REGION

LAND CAPABILITY CLASSIFICATION

WITH PERCENTAGE OF WATERSHED AREAS IN EACH CLASS



generally in grass. Pontypool soils in Cavan Township have longer slopes, and are subject to erosion.

Bondhead and Brighton soils, common to Cavan Township are level or gently sloping. The Dummer soils, so common in the north-east part of the Authority area have slopes generally between 3 per cent and 7 per cent and hence are described as gently sloping.

(2) Erosion

Considering the watersheds as a whole, erosion is not a serious problem, as may be seen from the accompanying graph. Pontypool soils are subject to the most serious erosion, and they occupy only 3 per cent of the area of the watersheds. On the most seriously eroded Pontypool soils, located in Cavan Township, the problem has already been recognized, and the worst problem areas have been reforested, or are in permanent grass cover.

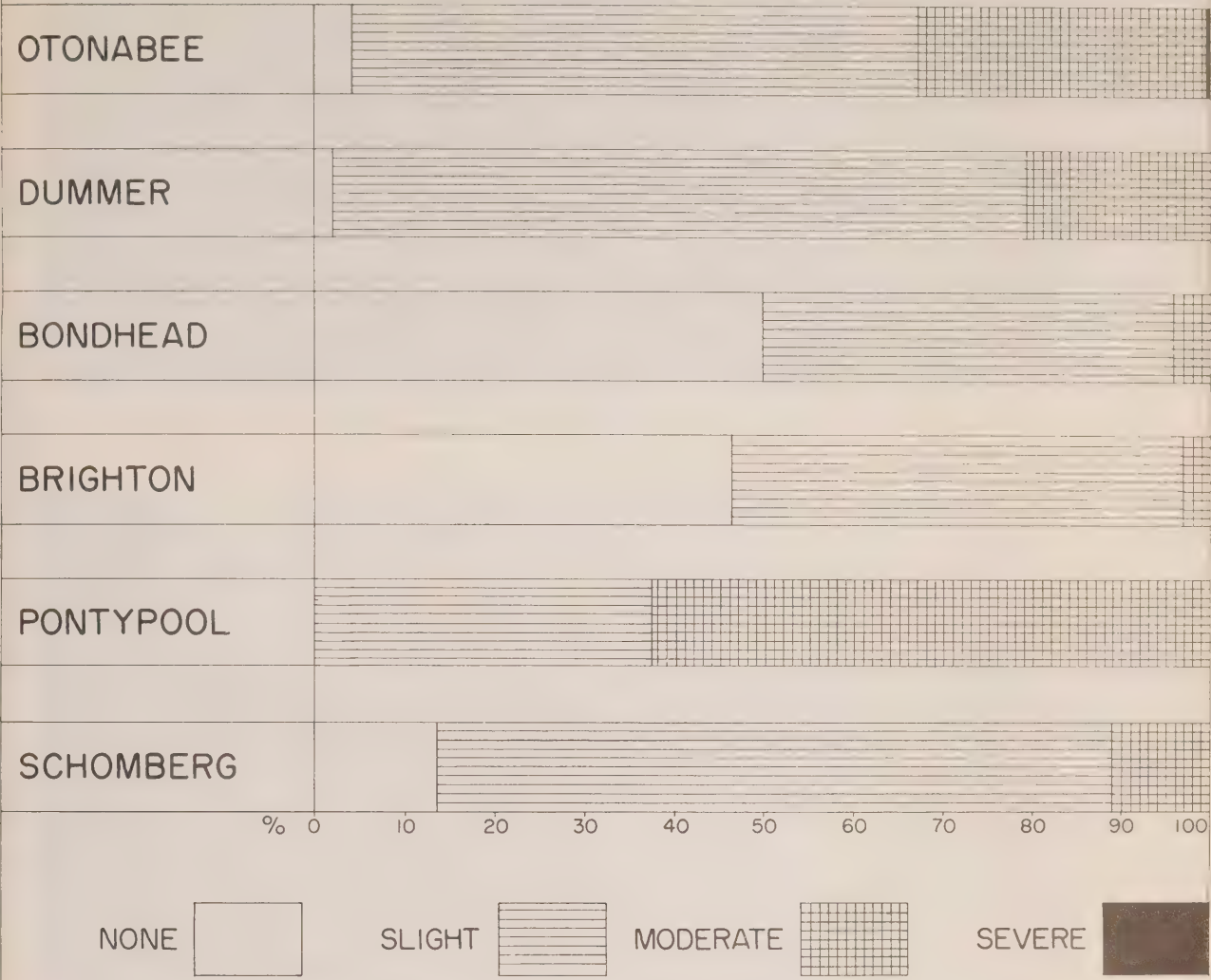
Nevertheless, although there is little serious erosion, a large part of the area has been subjected to at least some erosion. Usually this is sheet erosion, slowly removing the topsoil layer. Measures to prevent or curtail sheet erosion are necessary in many fields. Such measures will increase soil fertility and organic matter, and hence productivity.

(3) Drainage

Most of the agricultural soils of these watersheds are well drained, in fact some are excessively so. However, about 14 per cent of the area surveyed is classified non-agricultural because of poor drainage. This is made up of muck, marsh, swamp and bog areas that have no agricultural value under present conditions. Such areas as Cavan bog, Buckley swamp, and the extensive scattered wetlands in Douro and Dummer Township, and the marsh areas along the streams, and at the mouths of the rivers have no present agricultural value. Such tree growth as they produce may have limited value but is mostly scrub. These areas cannot be used for crop production unless drained and it is doubtful that even if drained they would have much agricultural value.

OTONABEE REGION
EROSION IN RELATION TO MAJOR SOILS
AND TO SLOPE

RELATIONSHIP BETWEEN EROSION AND SIX MAJOR SOILS
OF THE WATERSHEDS



RELATIONSHIP BETWEEN EROSION AND DEGREE OF SLOPE
ON WATERSHED LAND

OCCURRENCE OF EROSION ACCORDING TO SLOPE DESCRIPTION

<div>SLOPE</div> <div>EROSION</div>	LEVEL 0-2%*	GENTLY SLOPING 2-7%	ROLLING 7-10%	HILLY 10-20%	STEEP 20% +
NONE	7.4%	2.8%			
SLIGHT	3.0%	43.5%	12.6%	1.4%	
MODERATE		4.3%	10.3%	13.6%	.7%
SEVERE					.4%
VERY SEVERE					

* PERCENT SLOPE INCLUDED IN EACH SLOPE DESCRIPTION



Stony Class VII land on the Dummer moraine should be in forest. There are extensive areas of such land in the Authority.



Class V land, - low, poorly drained.



A small area of Class II land on the Dummer moraine near Warsaw.

Of the land producing crops or pasture, over 80 per cent is well drained and 8 per cent imperfectly drained. Monaghan, Tecumseth and Smithfield soils are the main imperfectly drained ones; with improved drainage, they are quite productive. Tile drainage is generally recommended.

Poorly drained soils are often found in the depressional areas between the drumlins. Many of the inter-drumlin areas are Lyons soil. Some have been drained and are in cropland, many are in unimproved pasture, scrub or woodland. Generally they will not repay the cost of artificial drainage, particularly where the soil is stony.

2. Cavan Township

Cavan Township, or that portion of it within the Authority, was selected for a more extensive sample survey. The township was picked because it presented a greater diversity of topography and soils than other similar areas within the Authority. Cavan Township totals 62,180 acres, of which 61,330, or 98.5 per cent is within the Otonabee Watershed.

Southern and westerly parts of the township are in the Oak Ridges moraine. The north part is till plain, on which are numerous drumlins, while the central part was once covered with glacial Lake Jackson.

(a) Present Use

Land uses in Cavan Township are essentially the same as for the whole Authority area. Cultivated land (only land actually broken up and in grain or fallow) took up about 22 per cent of the area, of which less than 1 per cent was in row crop. Tobacco and corn made up the row crop acreage, with tobacco being grown in the Pontypool sands in the south part of the township. Only a small portion of the extensive tobacco growing area in Durham County south of the moraine extends into Cavan.

Fall wheat, oats and mixed grain make up most of the cropland. Most of the grain is grown for feeding live-stock on the farm.

OTONABEE REGION CONSERVATION AUTHORITY AGRICULTURAL LAND CAPABILITY CLASSES

CAVAN TOWNSHIP
(WITHIN THE AUTHORITY)

— LEGEND —

LAND SUITABLE FOR CULTIVATION

- CLASS I
- CLASS II
- CLASS III
- CLASS IV

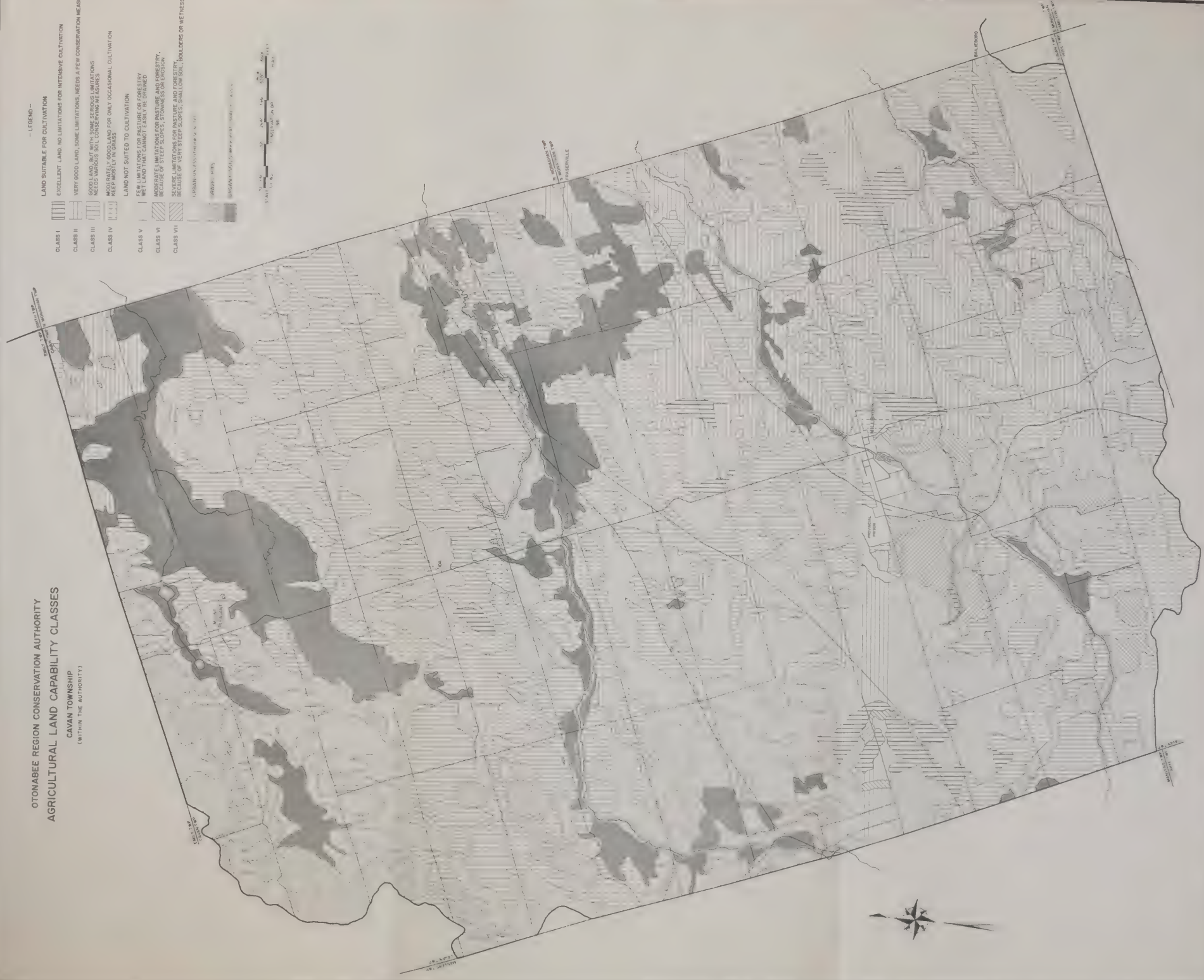
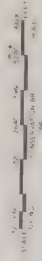
EXCELLENT LAND, NO LIMITATIONS FOR INTENSIVE CULTIVATION
VERY GOOD LAND, SOME LIMITATIONS, NEEDS A FEW CONSERVATION MEASURES
GOOD LAND, BUT WITH SOME SERIOUS LIMITATIONS
NEEDS VARIOUS SOIL CONSERVING MEASURES
MODERATELY GOOD LAND FOR ONLY OCCASIONAL CULTIVATION

LAND NOT SUITED TO CULTIVATION

- CLASS V
- CLASS VI
- CLASS VII

FEW LIMITATIONS FOR PASTURE OR FORESTRY
NEEDS SOME CONSERVATION MEASURES
MODERATE LIMITATIONS FOR PASTURE OR FORESTRY
BECAUSE OF STEEP SLOPES, STONES OR EROSION
SEVERE LIMITATIONS FOR PASTURE AND FORESTRY
BECAUSE OF VERY STEEP SLOPES, SHALLOW SOIL, BOULDERS OR WEEDS

WATERBODIES
URBAN/INDUSTRIAL DEVELOPMENT



Hay and pasture land takes in over 23 per cent of the township. This is land which can be cultivated, but at the time of the survey was in grass. Unimproved pasture accounted for another 22 per cent. This category included land with less than 50 per cent tree cover. All types of land in grass account for 45 per cent of the township area.

Over 30 per cent of Cavan Township is in woodland. This category includes all land more than one-half covered with trees. About 1,000 acres are reforested land.

Over one-half of the township has either never been cultivated (woodland) or has not recently been broken up (unimproved pasture). Although about 70 per cent of the township area is of a land capability suitable for cultivation, only about 45 per cent has recently been cultivated.

(b) Land Conditions

(1) Slope

About 20 per cent of the township area has slopes not exceeding 2 per cent (2 feet per hundred) and hence can be classified as level. Another 45 per cent has slopes ranging from 2 per cent to 7 per cent, and is described as gently sloping. Hummocky or rolling land accounts for over 15 per cent; hilly, with slopes up to 25 per cent, for over 17 per cent of the township area.

Considering limitations of slope alone, some 65 per cent of the township could be regularly cultivated. Otonabee and Pontypool soils have the steepest slopes. Bondhead and Schomberg soils, occupying 15 per cent of the Township's area, have the most level land.

(2) Erosion

As might be expected, the soils with the steepest slopes, Pontypool and Otonabee, are subject to the most erosion. Portions of the land most subject to erosion have been reforested. Fortunately, less than 1 per cent of the area of the township is being severely eroded.

About 6 per cent of the township's lands show few signs of erosion; 50 per cent are subject to slight erosion, and 26 per cent to moderate erosion.

Although erosion is not a serious problem in management of the land, it is none the less a factor in reducing the capability and potential crop response on many farms. Moderate erosion may not appear serious, but since it generally occurs as sheet erosion, may proceed for years with the landowner paying little attention. In this time it often destroys the topsoil, and makes good crop production more difficult and more expensive.

(3) Drainage

Nearly three-quarters of Cavan Township is well drained; about 5 per cent is imperfectly drained, and 6 per cent poorly drained. Some of these soils can often be artificially drained to make them adaptable to a wider range of crops.

About 15 per cent of Cavan Township is classified as very poorly drained. It mostly consists of bogs, marshes and bottomland. The largest single area is Cavan bog, which is described more fully in Chapter 6 of this report. Most of the very poorly drained land has little agricultural value, and should remain in its present state - that of forest cover. Much of it could be improved for this purpose from its present state.

3. Drumlinized Till Plain

The drumlinized till plain, otherwise called the Peterborough drumlin field, is described with regard to its physiography, in Chapter 2. It is one of the outstanding landscape features of the Otonabee Watershed. An aerial photograph shows the characteristic pattern of many low oval hills all pointing in the same direction.

To obtain a more detailed picture of land conditions in this rolling drumlin area, a sample survey of some 20,000 acres was done. This acreage was contained in a strip running east from the city of Peterborough along both sides of

No. 7 highway to the eastern boundary of the Indian Creek Watershed.

(a) Present Land Use

The land-use pattern in the drumlin area shows but slight variation from that of the whole watershed. About 15 per cent of the land is in grain or row crops, 28 per cent improved pasture or hay, 21 per cent unimproved pasture and 32 per cent woodland. As compared to the whole Authority area, these figures show a decrease of 2 per cent in grain, and increases of 2 per cent in woodland and 3 per cent in improved pasture or hay.

(b) Land Conditions

Nearly 90 per cent of the soil of the sample strip is Otonabee. This sandy loam is high in lime, moderately stony and fairly easy to cultivate. This soil provides a good basis for the livestock industry, both beef and dairy, which predominates in the farming picture. Commercial fertilizers are used to some extent; greater use would be beneficial as the soils are only moderately fertile.

Small amounts of Bondhead (4 per cent), Brighton sandy loam (1 per cent) and Cramahe gravel are also to be found. The Cramahe gravel is common to the ridges or eskers which run through the area. It is of little use for crops but does provide a gravel source for construction and road building.

The largest part of the drumlin area (43 per cent) can be classified as gently sloping, with slopes not exceeding 6 per cent. About 14 per cent is level - found mostly in the inter-drumlin areas. Some 26 per cent has slopes between 6 per cent and 10 per cent and is rolling. Another 15 per cent is hilly and 2 per cent is steep with slopes over 25 per cent. These slopes are characteristic of a drumlin area. They do not present any serious hazard to cultivation. However, the hilly and steep land on the sides of some of the drumlins should be under permanent sod, or trees.

In common with the rest of the watershed, erosion is not a serious problem, with nearly three-quarters of the area showing only slight erosion. Moderate sheet erosion occurs on some of the steeper slopes; measures should be taken to protect this land.

Some poorly drained and swampy areas are found in the low land between the drumlins. Some of it has been drained; most such land is in rough pasture or in bush.

4. Area Adjacent to the City of Peterborough

Considerable areas of land along the river and canal are owned by the Canada Department of Transport. It would be desirable if a larger portion of land along parts of the river and canal could be brought under public ownership. A scenic parkland strip, more adequate and attractive than now exists, could be developed along the river south of the city.

Some land along the banks of the Otonabee River, south of the city is subject to flooding at periods of high water level such as occurred in the spring of 1960. This area, located in Concessions IX and X of North Monaghan Township along the west side of the river, is presently mostly used as farmland or for market gardening. Building on this land should be restricted until such time as means are worked out to more closely control water levels in the Otonabee System.

North and west of the present city limits Jackson Creek flows from Cavan bog through a very small lake called Lily Lake, and through the city into the Otonabee. On the edge of the city this stream flows through a deeper valley. This valley is a valuable asset in the topography of the area, and could provide a scenic "green belt" or conservation lands. Their use for these purposes should be encouraged.

The agricultural use of farmland adjacent to growing urban areas is often affected. Factors such as the amount of land held by speculators, increasing land values, high taxes and opportunities for non-farm employment often tend to

discourage use of otherwise fertile land for farming. Around many major urban centres large tracts of land lie idle, either awaiting urban development which may not come for years, or idle because owners have found remunerative off-farm employment. Such effects on rural land surrounding urban areas are sometimes described as "sterilization".

No actual investigation was made during the conservation survey to determine urban effects on rural land around Peterborough. However, a survey of present land use was made, and this indicated very little land that could be classified as idle. Whatever effects any increases in land values or real estate taxes may have on land around the city, most of the land is still being actively used for agriculture.

Peterborough is the only major urban centre in the area of the Authority. During the past 20 years, its population has doubled from 25,500 in 1940 to over 50,000 in 1960. During the same period there has been considerable urban growth in the surrounding townships of North Monaghan, Smith, Douro and Otonabee. It is estimated* that the total population of the Peterborough area will reach 67,000 by 1970 and be in excess of 85,000 by 1980.

Some special attention was given as part of the conservation survey to the area adjacent to the city boundaries. This was done because land conditions are often most critical in areas changing from rural to urban use. There is little doubt that Peterborough will find it necessary to expand its boundaries as it has done several times in the past 20 years to accommodate its increasing population.

While land resources in the Peterborough region are plentiful, this does not reduce the need for careful survey of these resources in light of the anticipated need. It seems likely that urban expansion will continue to be most rapid

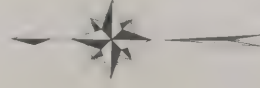
* Ontario Dept. of Economics, "Population Projections for the Economic Regions, Counties and Urban Areas of Ontario, 1956 to 1976".

towards the west and south-west. This has been the pattern in the past. To the east of the city, the Otonabee River and the canal tend to form barriers to providing services to expansion. The topography east of the city is less satisfactory for building, with many steep-sided drumlins and poorly drained inter-drumlin areas.

Land surrounding the city is generally farmland. Much of the soil is Otonabee loam - well drained, usually somewhat stony, and rolling to hilly. There are some poorly drained depressional areas. The land west of the city is broadly rolling with fewer drumlins and fewer wet depressions than to the east and north. This makes the area to the west reasonably well suited to building purposes.

While the Trent Canal and the Otonabee River tend to be a barrier to easterly expansion of the city, they are at the same time a great asset. The canal and its locks attract many tourists both by water through the canal system, and by road to look at the locks. Good planning will preserve and develop this asset by keeping it free from undesirable encroachment. As well as being an attraction in itself, the river system flows through often scenic surroundings. This is particularly true to the north of the city.

DRAINAGE CONDITIONS



OTONABEE REGION CONSERVATION AUTHORITY
CITY OF PETERBOROUGH AND ADJACENT AREA

SHOWING
EROSION CONDITIONS

-LEGEND-

N	NONE
S	SLIGHT
MC	MODERATE
SA	SEVERE
SP	GRAVEL PIT
M	MUCK
U	URBAN
BL	BOTTOM LAND



CHAPTER 5

USE AND MANAGEMENT OF THE LAND

1. Past Development

Prior to 1818, the Otonabee Watershed was covered with forest which no settler had penetrated. In 1818, immediately following the completion of the township survey, a party of English immigrants settled in Smith Township, on the present border of Peterborough.

Settlement in the area proceeded slowly. By 1825 only a handful of settlers were to be found in Otonabee and Douro. There were but two or three in the present area of Peterborough which was then called "Scott's Plains". But during 1825, a large number of Irish immigrants were brought to the township. Each family was allotted 100 acres, on which a shanty had to be built. To enable them to make a start in the new land, each family received "a cow, an axe, an auger, a handsaw, a hammer, 100 nails, 2 gimlets, 3 hoes, 1 kettle, 1 frying pan, 1 iron pot, 5 bushels of seed potatoes and 8 qts. of Indian corn".*

The energy of these early settlers is shown by the following figures giving the results of their first year's work.

Township	No. of Locations	No. Acres Cleared	Produce Raised-Bushels		
			Potatoes	Turnips	Corn
Douro	60	245	8,250	4,175	1,777
Smith	34	113	4,800	1,550	637
Otonabee	51	186	10,500	4,250	1,395

During 1827, it was reported that a surplus of wheat was grown, and that some 5,000 bushels were sold to Peterborough merchants.

* Poole, T.W, M.D. "A Sketch of the Early Settlement and the Subsequent Progress of the Town of Peterborough and the County of Peterborough", 1867. Printed by the Peterborough Examiner, and reprinted with additions, 1941.

Encouraged by the success of these early immigrants, more settlers came into the area. By 1838, Peterborough had some 900 inhabitants with 150 houses. Roads were being built in the townships, as were mills. After the settlers had cleared sufficient land to build their homes, and grown enough crops to feed their families, they turned to some crop that could be sold or bartered. For many parts of Ontario this meant wheat.

The part wheat played in the early agriculture of this region is noted in the report of the Colborne District Agricultural Society for 1847. It stated that:

".....we find much cause for congratulation in the steady and rapid advancement in both the quality and quantity of the agricultural products of this District since the formation of this Society. This advancement is perhaps most observable in the article of wheat and flour. Up to the year 1842, it is known, not more than 2,000 bushels of wheat was sent out of the District for sale in any one year. During the last year (1847) upwards of 20,000 bbls. of flour and 30,000 bushels of wheat were sent off by the merchants of this district alone; independently of the large quantities of wheat (probably not less than 50,000 bushels) taken out by the farmers themselves and sold at the ports on Lake Ontario".

This same report mentions that there were no mills capable of manufacturing flour in 1842, but in 1847 there were eight. In 1842 only one threshing mill existed; now 50 are in use, 30 of them having been manufactured by a Peterborough factory. In 1847, local factories made 800 ploughs. Many horse rakes, drill ploughs, harrows, cultivators and other implements were in general use.

Within the same period several woollen mills had been built. The market they offered was credited with a marked expansion and improvement in sheep raising. Similar improvement was noted in cattle, but regret is expressed that similar good changes had not extended to horses.

The first railroad to reach Peterborough was built in 1854 across Rice Lake from Cobourg. Its usefulness was short-lived because of the difficulties of keeping the line

across the lake intact against the ravages of winter storms and ice. In 1858 a feeder line from the Port Hope to Lindsay line was extended into Peterborough. Rail service ended the isolation of the inhabitants, and greatly extended their markets.

By 1865, it is reported that 37,000 bbls. of flour, 31,775 bushels of wheat, and 13,960 bushels of barley were shipped from the Peterborough railway station.

The first cheese factory for the area was built in Smith Township in 1866.

Fife Wheat One of the noteworthy events in the history of agriculture in Canada was the introduction of Fife wheat and its subsequent use in the development of many other varieties and strains. Fife wheat was first grown on the farm of David Fife, Otonabee Township about 1842. The story of wheat is inseparably connected with Canada's history, the building of our railroads, the growth of our cities and of our western provinces.

The publication "Canadian Farm"* carries a letter from Mr. Sylvester Fife, David Fife's son, in which he describes the introduction of this famous wheat in part as follows:

"The late David Fife, Otonabee, wished to see the quality of Canadian wheat improved, and sent to Scotland for samples. Some were sent to Port Hope, where they lay in warehouses over winter. They were sowed in the spring, but came to nothing. My father then wrote again to his friend, Mr. Struthers, clerk in a grain store in Glasgow, for the second supply of wheat. Mr. Struthers noticed a new kind, an excellent sample, brought by ship direct from Danzig. He thought it would be just the kind for Canada, and sent two samples, one of fall wheat, and the other of spring wheat. These were sown in the year 1841. They also laid in the storehouse at Cobourg during the fall and part of the winter. In the spring each sample was sown. The fall variety came to nothing, but the spring sample proved superior to any other kind sown. Out of this, 3 ears were saved.

* Reprinted from "Canadian Farm" April 12, 1912, as published in 1941 reprint of "A Sketch of the Early Settlement..... in the County of Peterborough", T.W. Poole, M.D.

This was on the farm of my father, David Fife, now occupied by me. But owing to the illness of my mother, who took special charge of this wheat, it was not sown until after the other wheat was above ground. At harvest time the Siberian wheat was badly rusted, whereas this sample was not affected in the least. This crop was gathered by my mother and brother David and carefully stored away. They had now realized a quart of seed. This was sown the following spring by my mother and brother and produced one-half bushel at harvest time, and from the produce of this half bushel, my neighbours were supplied and the country benefited by the introduction of Fife wheat. Among other neighbours, Mr. Henderson bought a bushel, and from the second sowing of the same reaped 300 bushels, part of which he carried to Keene and turned in to the agricultural society for \$3.00 a bushel, wrongly calling it the Glasgow wheat. It never grew in Scotland but was imported directly from a ship arrived from the Baltic."

2. Present Use

Agriculture in these watersheds centres around livestock production, milk and meat. Cheese production used to be important but in the past 30 years it has been replaced by whole milk production for the local market and, increasingly, for the Toronto markets. Considerable milk goes into ice cream, powdered milk and other uses. Dairying is the most important enterprise, with 1959 figures in Peterborough County, indicating over 16,000 head of stock kept for dairy use as against 9,000 for beef purposes. Hogs are an important source of income on many farms. Poultry has ceased to be a sideline and indeed many farmers no longer keep poultry even for family egg supply. It has become a specialized type of farming with large investments in buildings and equipment.

Climatic conditions do not favour the growing of cash crops such as grain corn, orchard fruits and canning crops. An exception is the extension of the Durham County tobacco-growing area into the south edge of Cavan Township, along the moraine.

The conservation survey of the area included a 25 per cent sample survey of present use of the land in the watersheds. It showed the following major uses:-

1. Cultivated - grain, row crops or fallow	16 per cent		
2. Hay pasture - improved pasture or hay crops	25	"	"
3. Pasture - unimproved	22	"	"
4. Woodland	31	"	"

The considerable acreage of woodlots can be accounted for by the extensive areas of low-capability land to be found in parts, particularly north and east, of the watersheds. The need for high-quality hay and pasture is reflected in the fact that 25 per cent of the area is devoted to it with a further 22 per cent of unimproved pasture; in other words, nearly 50 per cent of the region is growing feed for the dairy and beef industry.

In a broader sense, an important factor in land use, and in the economy of some parts of the watershed is the tourist industry. The shores of the lakes bounding the Authority area, and of the Otonabee River, are sites for hundreds of cottages. Supplying the needs of the tourist industry is an important income source for some local residents.

IMPROVED LAND AREA, NUMBER OF AND AVERAGE
SIZE OF FARMS IN MUNICIPALITIES IN AUTHORITY AREA IN ACRES*

Township	Total Area Occupied Land	Area of Improved Land	Per Cent	No. of Farms	Average Size
Douro	33,345	18,774	55	211	158
Dummer	37,600	15,469	41	186	202
Monaghan N.	10,602	6,986	66	87	122
Otonabee	60,359	39,438	65	395	153
Smith	44,393	28,054	63	255	174
Monaghan S.	18,061	12,019	66.5	115	120
Cavan	53,259	32,973	61.5	334	160
Total	257,619	153,713	40	1,583	163

* Data from Dominion Bureau of Statistics Census, 1956.

3. Future Land Use Changes

That there will be many changes in agriculture and land use requirements in Ontario during the next 15 years is very evident from the rapid and many changes in recent years. These changes will affect different parts of Ontario in different ways. Just what form they will take can only be an "educated guess" based largely on past patterns and projected population figures.

Population figures, past, present and projected future, for the Peterborough area, are as set forth in the following tables:-

POPULATION: PAST TRENDS*

	1901	1911	1921	1931	1941	1951	1956
Peterboro Co.	36,066	40,783	42,261	43,958	47,392	60,789	67,981
Peterboro City	11,239	18,360	20,994	22,327	25,350	38,272	42,698

POPULATION: FUTURE PROJECTIONS*

	1961	1966	1971	1976
Peterboro Co.	79,000	88,000	98,000	111,000
Peterboro City	51,000	57,000	63,000	70,000

* Information from "Population Projections for Economic Regions, Counties and Urban Areas of Ontario, 1956 to 1976" Ontario Department of Economics.

Most of the projected future growth of Peterborough County will take place in and adjacent to Peterborough City. Rural farm population will likely continue to decline. There will likely be increases in the rural non-farm population, particularly if industrial employment opportunities in larger urban areas continue to increase.

Soils and climate in these watersheds are such that no major changes in rural land use are likely to occur.

The region will continue to be livestock country. There may be a continued shift to dairy production with the increasing demands for milk in urban centres.

The difficulties of economical agricultural production may cause some of the marginal land, now in agriculture, to go out of production. Some of the land in the Dummer moraine should best be used for permanent pasture or for forest production. It seems likely that when present owners are through with some of the properties, this will happen.

Recreation and the tourist industry will play an increasingly important part in the region. An increasing population, not only within the region, but also beyond, will seek cottage sites, playgrounds and public parks. It is unfortunate that, even now, little of the extensive lake shoreline is available for public recreation. Recreation can perhaps be combined with forestry in some of the marginal land areas now being used for subsistence agriculture.

4. Soil Management Problems

Many factors contribute to problems in management of soil. Some are physical problems of the land, others are economic or social. This report is concerned with the physical problems of soil management.

In Ontario, the main problems of soil management are those of drainage, fertility and erosion. On any one farm, or on any one piece of land, one problem may predominate; often, however, it is a combination of all three.

(a) Drainage

Of the various problems of managing the soil, one of the biggest is the safe disposal of excess water. Its uncontrolled run-off can cause erosion. When desirable, as much as possible should be allowed to soak into the ground.

Excess moisture may be on the land surface, or within the soil itself. On most farms it is necessary to get

rid of both. Adequately drained land is necessary to good farm management.

Surface Drainage

To safely remove excess water from the surface of the soil may require special measures. These may include grass waterways, diversion ditches and protective measures along streambanks.

There are many places in the Authority area where grass waterways and other surface water disposal systems are needed. These may include ditches on farm fields, or improved ditches and culverts along township and county roads.

Internal Drainage

A system of tile drainage is often used to remove excess internal soil moisture. Tile drainage of wet soils is a major contribution to soil conservation. Some of the most productive soil in Ontario is only productive because it has been drained. Drainage allows increased yields of crops in low, wet areas and permits slopes, where serious erosion is likely to occur, to be planted to more appropriate crops. The controlled removal of excess water from fields can be an aid in combatting soil erosion.

Poorly drained fields, when tile drained, permit increased yields of crops of better quality. The growing season can be longer by reason of earlier planting. With drainage, more flexible, better crop rotations and management practices can be used.

(b) Fertility

Soil fertility is the ability of any soil to supply the nutrients necessary to plant growth. Maintenance of soil fertility is one of the major management problems of Ontario soils.

Differences in the productive capacity of various soils, or land, are commonly recognized on the basis of farming experience. The range in productive capacity of different

soil types is readily apparent where the same crops are grown and the same general farming practices followed.

Differences in soil fertility may be inherent in the soil itself or may be related to past management practices such as crop rotations, fertilization, cultural practices and susceptibility and erosion. Soil fertility, it should be noted, is not the same as soil productivity, for an otherwise fertile soil may be limited by drainage or other such factors lessening production.

It is difficult to actually measure whether the fertility of soil is being maintained or not. It might be assumed that, if crop yields do not decrease, fertility is being maintained. However, the use of improved varieties of crops, better tillage methods and differing rates and methods of planting, may maintain or even increase yields without any increase in soil fertility.

Maintenance of soil fertility is more than just the application of fertilizer to the ground. It also includes build-up and maintenance of adequate organic matter, liming of acid soil and protection against erosion.

Organic matter levels may be increased or maintained by use of green manure crops, by application of barnyard manures and by working crop residues into the soil. Plenty of humus in the soil aids in improving soil structure and makes better use of commercial fertilizer.

Before application of commercial fertilizers, it is important that soil tests be made. Tests are used to determine the available supply of plant nutrient materials in the soil. Soil tests are a guide to the farmer in deciding the fertility needs of his soil; they must be accompanied by observation of crop conditions.

Soil sampling equipment and instructions may be obtained from the Agricultural Representative's office.

Department of Agriculture publication "Help yourself to a Soil Test" (Circular 181) gives complete information on taking soil samples.

(c) Erosion

Soil erosion has been an agricultural problem ever since man began to till the soil. In some parts of the world, erosion has destroyed great tracts of land for any sort of agriculture. Fortunately in Ontario most of our soils are not subject to such serious erosion as are for example some parts of the United States.

Soil erosion may be defined as "the movement of soil particles from one place to another by wind or water". Under natural conditions soil is covered with vegetation which retards run-off and slows down erosion. When land is cleared for cultivation the natural protective cover of vegetation is removed or reduced. Cultivation may change the structure of the soil and reduce organic matter. Such changes may easily produce, in a short time, a less productive soil.

Since man must till the soil to produce food, it is necessary to carefully fit the crop or the farming practice to the type of land being used. We must protect the soil in so far as possible by coming as close as we can to duplicating nature's protective measures to reduce erosion and run-off.

Factors Affecting Erosion

Of the several factors and practices contributing to soil erosion on any given piece of land, the most important is the physical character of the land itself. Soil texture, and length and amount of slope influence the amount of erosion that may take place. On top of this is the amount and time of rainfall and the cultural practices of the landowner.

Slope - The slope of the land, both in length and in steepness, has an affect on run-off and consequent erosion. The steeper the slope, the more rapid the run-off, and the greater its ability to erode the soil.

Steepness of slope is measured in per cent.

A 5-per-cent slope means that that slope has a fall of 5 feet per 100 feet of length.

Rainfall - The character and pattern of rainfall over a watershed has a definite influence on erosion. Intense rainfall causes a larger immediate surface run-off than does a slow drizzle. It is these intense rains, usually lasting but a short time, that cause the greatest amount of erosion. Heavy spring rains, when the soil surface is soft, but the subsoil still frozen, are often particularly damaging.

Basically, the effect of rainfall on soil is the effect of the splash of the individual raindrop itself. A falling raindrop has tremendous power, and acts as a major erosion agent. When a drop hits bare soil it moves particles of earth. This action is multiplied billions of times in a heavy rainfall. Protective plant cover interrupts the falling raindrops, robbing them of their energy and easing them to the ground with little damage.

Use of the Land - Vegetation, whether leaves of trees or plants, litter of the forest floor, or sod cover, breaks the force of the rainfall. There is little or no run-off, and erosion is slight.

Rainfall on clean cultivated fields stirs up the unprotected soil, and there may be a great deal of run-off with subsequent erosion. Cultivation practices followed by the landowner have a great effect on the amount of run-off. Good sod cover will absorb rain rapidly and little is lost as surface run-off. A grain crop will give only partial protection to the soil. Row crops are little better than uncovered soil.

Cultivation up and down the slope, soil left bare over winter and the use of row crops on sloping land all contribute to water run-off and erosion on any given piece of land.

Types of Erosion

Erosion can be caused by either wind or water. In Ontario wind erosion is not usually a serious problem. However, extensive damage by wind erosion has occurred in some of the light sandy soils of the Oak Ridges moraine. This damage was once extensive in the headwaters of the Ganaraska River. Much of it is now controlled by reforestation and improved cultural methods. There are some localized spots of wind-eroded soil on the north side of the moraine in the Otonabee Watershed. For the most part, however, they are under control.

Water erosion can be divided into three types, - sheet, rill and gully, although there is no fine line of division.

Sheet erosion is the slow, persistent wearing away of the soil. It is the least spectacular form, and often proceeds unnoticed. It is the most common type of erosion in these watersheds. It is common on the slopes and tops of the drumlins.

Rill erosion is caused by water digging out small channels a few inches deep as it runs off sloping land. Rill erosion is common on fields in the spring.

Gully erosion occurs when water run-off is concentrated in channels that are unprotected. It is the most spectacular form of erosion. Fortunately there are few examples of gully erosion in these watersheds. Such gullies as were found during the conservation survey were mostly in Cavan Township; frequently they were caused by draw-back from existing ditches.

Effects of Soil Erosion

The effects of soil erosion will likely first be noticed on the fields from which the soil has been lost, but effects may be more general. Soil erosion causes silting and pollution of streams; it fills in ditches, and may clog up drainage systems. On rivers that flow into harbours, it silts up the harbours causing endless expense in dredging.

Loss of Topsoil - The loss of soil by any type of erosion means the loss of the most valuable portion of soil resources - the topsoil. This layer contains the humus and nutrients necessary for productive crop response. Potential yields are reduced, and so are the owner's profits. It is more difficult to grow good crops in subsoil and it is usually much less profitable. The effects of soil loss vary, of course, with the type of soil, and with the crop being grown.

Loss of Water - Water loss from the land is not a result of soil erosion, but the cause of it. Nevertheless, water loss from excess run-off is often more serious than erosion. Cultivation practices that decrease the possibility of soil erosion also decrease excessive water run-off. This is particularly important during the summer months when lack of moisture may be a limiting factor in crop yields. The more rainfall that can be absorbed into the soil in dry seasons, the greater amount will be available for plant growth.

Pollution - Much of the soil lost from the land eventually finds its way into stream courses and rivers. Many otherwise clear streams are polluted by soil wash. Such pollution, while not a health hazard, does affect fishing conditions in the streams; in some streams it can be a limiting factor. Silt blankets the stream beds and destroys many organisms that live there and provide food for the fish.

5. Conservation Measures

An important objective in good soil management is to protect soil from erosion and to hold as much as possible of the rainfall in a place where plants can effectively use it.

One of the goals of conservation farming is to keep soil losses as close as possible to the rate of loss in a natural landscape. It is usually impossible or impractical to use a farming system that will completely control soil losses. A farmer should be always aware, however, of the rate of soil

loss and depletion caused by his particular practices, and be ready to change or adjust them if it seems necessary.

A cover of vegetation is the first defence against erosion. Therefore a good soil management program will include an increasing quantity and quality of vegetative cover as the land use capability class falls from Class I to Class VIII. This cover may be in the form of permanent sod for pasture, or grassland strips alternated with cultivated land in strip-cropping or sod-covered channels for the safe run-off of excess water.

(a) Grassland

Grassland is hay or pasture. For years, many farmers regarded pasture as a second-rate crop. Fields not suited to cultivation were left to pasture. Usually no measures to improve them were taken. Today, many farmers are finding that an abundance of forage is the very foundation of profitable livestock farming.

The production and management of first-class pasture is not a simple job. It is often as difficult to produce good pasture as to grow grain or a cash crop. A peculiarity of grassland is that it is a combination of grasses and legumes, each with its own characteristics as far as fertility and soil requirements are concerned.

Grassland is of prime importance in controlling erosion and improving soil organic matter and soil moisture relationships. Grassland farming should be an integral part of the crop rotation system. Areas unsuited to cultivation should be put into permanent grass cover; other areas should have a sufficient proportion of grass to protect the soil and improve the production of cultivated crops.

Grasses and legumes provide organic matter for the soil and give it maximum protection against erosion. By improving soil structure and providing protection against the impact of the raindrop, water is dispersed. It is more easily



Contouring and strip cropping on this farm in South Monaghan Township, aid in reducing water run-off and soil loss on sloping land.



Alternating strips of grass and hay on a Smith Township farm.



This Class VI land on the Oak Ridges moraine in Cavan Township, is light and sandy. Tree cover is its best use.

able to enter the ground to the benefit of the crop and of the ground water supplies.

Advice on seed mixtures for permanent pastures renovating old ones or for controlling erosion can be obtained from the County Agricultural Representative, or other personnel of the Department of Agriculture or from a local seedsman.

(b) Grass Waterways

Grass or sod waterways are watercourses on sloping land. They may be natural or they may be man-made. Whatever their origin they are kept in permanent sod. Grass waterways are the most important single item in the control of water run-off from cultivated land for they are a means of conducting excess water safely from fields without allowing erosion to occur. They are a simple and effective erosion control measure that can be used by any farmer.

The best locations for waterways are usually the natural drainage ways of the landscape. In many cases these have always been left in sod, and should continue to be so. The simplest grass waterway is made by tripping cultivating implements as they cross a natural depression. In other instances waterways must be laid out and constructed in order to carry run-off safely.

When constructing a new waterway, it should be large enough to carry safely the heaviest rainfall anticipated in, say, a period of 10 years. A waterway should be broad and shallow; it should have a dense sod cover established on it as soon as possible. This sod cover should be maintained by regular fertilizing and, of course, it should never be broken up by cultivation.

Gullies are a symptom of land misuse, usually caused by cultivating too steep land or over-grazing it. Gullies often start in the banks of natural watercourses that have been cut to a considerable depth.

When still small, gullies can be shaped into grass waterways to prevent any further erosion. More serious

gullying will require more extensive, and usually expensive, treatment. This may involve mechanical measures such as small check dams, the planting of vegetation or trees to control erosion or the construction of diversion waterways to redirect the run-off water over another path, while the gully is being repaired.

There are many places where grassed waterways might well be used on farms in these watersheds. The rolling topography of Cavan Township, and the often steep-sided drumlins in other parts of the watershed will erode quite easily when subject to concentrated water run-off on cultivated fields. On most farms, grassed waterways can be easily and quite inexpensively constructed with the farmer's own equipment. In many localities municipal road maintenance equipment can be obtained for reasonable rental, and can be used to shape the watercourse.

(c) Contouring and Strip-Cropping

Strip-cropping is a system of growing crops in strips or bands laid out in a systematic manner as a barrier to erosion. The arrangement of crops in strips should be such that erosion-resistant crops, such as grasses, are alternated with clean cultivated crops which may be subject to erosion.

Contouring is the arrangement of the strips across the slope at right angles to the natural slope of the land. The best slopes for contouring are broad and smooth. Contour tillage is most effective on slopes of 2 per cent to 8 per cent, and not more than 300 feet long. Here the practice reduces soil losses to less than half that of up-and-down-hill cultivation. Satisfactory operation of strip-cropping may require the removal or relocation of fencelines. Most farms in this part of Ontario are laid out on a rectangular survey grid, hence fields are often not according to the "lay of the land", but fenced up and down the slope.

The main benefit of contouring and strip-cropping, is the reduction of soil and water losses. Another important benefit, however, is the greater ease and economy of farm operations. If strips are fairly long, there is less frequent turning, and power requirements are often reduced by "level" operation across the slope rather than up and down. One study showed savings of 13 per cent in time and 10 per cent in fuel when contour cultivation with power implements was substituted for up-and-down operation.

Contour cultivation, when used in combination with other good farming practices, effectively aids in conserving moisture. Small ridges and terraces formed by cross-slope cultivation act as small dams to retain water, and provide greater opportunity for its infiltration. In addition, the alternating sod strips slow down the water run-off and allow greater infiltration.

Sod strips alternated with cultivated land act as a barrier to water run-off from the cultivated strips. In some areas, particularly in tobacco-growing districts, sod strips are used as a barrier to wind erosion.

There are several farms in the area now using contouring and strip-cropping as a part of their soil management operations. This method of cultivation was recommended in their farm plan as a means of combatting the erosion problem on their sloping fields.

Advice and assistance on erosion control on cultivated land can be obtained through the Agricultural Representative from the Soils Specialists of the Ontario Agricultural College. He will be prepared to give assistance on laying out contours and strip-crops, grass waterways or the repairing of gullies.

(d) Woodland

Well-managed woodland plays an important part in any soil and water conservation program. It can help



Good buildings such as these reflect a prosperous farm on good quality land. This farm is near Mount Pleasant, in Cavan Township.

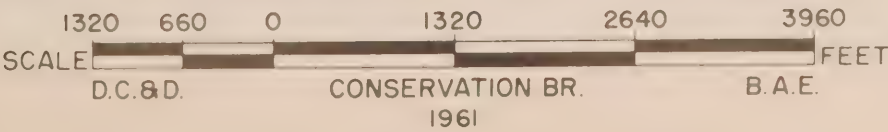


The ruins of this old barn near Warsaw on the Dummer moraine give evidence of the inability of this land to support agriculture.

LAND USE CHANGES
OTONABEE REGION CONSERVATION AUTHORITY



THESE TWO PHOTOS ARE OF AN AREA ON THE OAK RIDGES MORaine, CAVAN TOWNSHIP, LOTS 5 TO 9, CONCESSIONS II AND III. THEY SHOW CHANGES IN LAND USE OVER A SIX YEAR PERIOD. THE TOP PHOTO, IN 1954, SHOWS MANY FIELDS LARGELY IDLE, OR ERODED, OR IN VERY POOR PASTURE. BELOW, THE SAME AREA IN 1960 SHOWS THAT MANY PORTIONS HAVE BEEN REFORESTED. MOST OF THE REMAINING LAND IS IN PASTURE.



protect the individual landowner from soil and water losses. Forestry is important in the overall picture of resource management on a watershed basis.

Forestry can be an integral part of many farm management plans. Most farms in these watersheds have some area of woodland on them. Many could have more.

Certain land classes, particularly Classes VI and VII, otherwise described as submarginal land, should be under forest cover. If already wooded, they should remain so; if not, reforestation may be needed.

Reforestation is an erosion control measure on steeply sloping fields or about the sides and head of gullies. In the upper part of the watershed there is land which should be kept under permanent vegetation, either grass or trees. Some of this land can best be used as pasture, with areas of forest cover on the steepest slopes.

Woodland around springs, or the source area of streams, will often aid in the regulating or restoring of flow. A farm plan may recommend that certain areas of woodland be set aside for wildlife cover.

(e) Farm Drainage

Soil drainage is essential to good soil management. The successful use of many acres of good farmland in Ontario is possible only because of artificial drainage.

Some of the benefits of soil drainage are (1) increased yield and improved quality of crops; (2) earlier planting is possible and hence a longer growing season. (3) Drainage may make low, wet areas available for grain or intertilled crops. Slopes, where the erosion hazard is higher, can be put in grass. (4) It permits the use of more regular crop rotations; (5) the controlled removal of excess water from soils can be an aid in combatting soil erosion.

Excess water can be removed by means of open ditches or by tile underdrains. In the area of this Authority,

there is little need for open ditch drains; most drainage will be by means of tile.

Whatever the area to be drained, it is well to have a survey made before starting. A survey plan will show the proper location of mains and laterals, location of outlets, grades, depths and number of tile required.

The Department of Agriculture, through its agricultural engineering fieldmen will, upon application, carry out a survey for drainage work. Applications and information may be had from the Agricultural Representative's office.

Bulletin 501, "Farm Drainage", by the Ontario Department of Agriculture, gives information on all types of drainage situations.

(f) Farm Ponds

An adequate supply of water is essential on any farm for livestock and household use. In many areas the need for water supplies is increasing. This increase is due to the much greater demands for water on many farms - demands caused by increased numbers of livestock, piped water supplies in house and barn, water for spraying and irrigation. On many farms, wells are not able to constantly supply this increased water demand.

Farm ponds can be an excellent source of water supply. They may be used as emergency or regular supply of livestock water. If near buildings, they offer fire protection. They can be of use for irrigation or spraying and, in addition, they have value for recreation, fish and wildlife.

A pond may get its water from surface run-off, springs or a permanently flowing stream. When designing a pond, its use and the water source should be kept in mind. To be successful, a pond must be properly located and properly constructed.

The Authority should publicize the necessity of adequate and proper construction of ponds and dams. It should

be emphasized that care must be taken in the building of dams, that spillway capacity should be adequate and emergency spillways always provided. Many small dams have failed because these precautions have not been taken. It should be noted that the permission of the Surveyor-General for the Province is required before any structure may be placed across a permanent stream.

Technical assistance on the location and design of farm ponds and dams is available from the Agricultural Engineering Extension Specialist of the Department of Agriculture.

CHAPTER 6

THE CAVAN BOG

1. Soils

(a) Location

Cavan bog, or swamp (it is locally called both) is located in the north-western part of the Otonabee River Watershed, in the upper part of Cavan Township in Durham County. It occupies parts of Concessions XI to XIII. Small parts of the bog are found in adjacent Emily and North Monaghan Townships.

(b) Reason for Survey

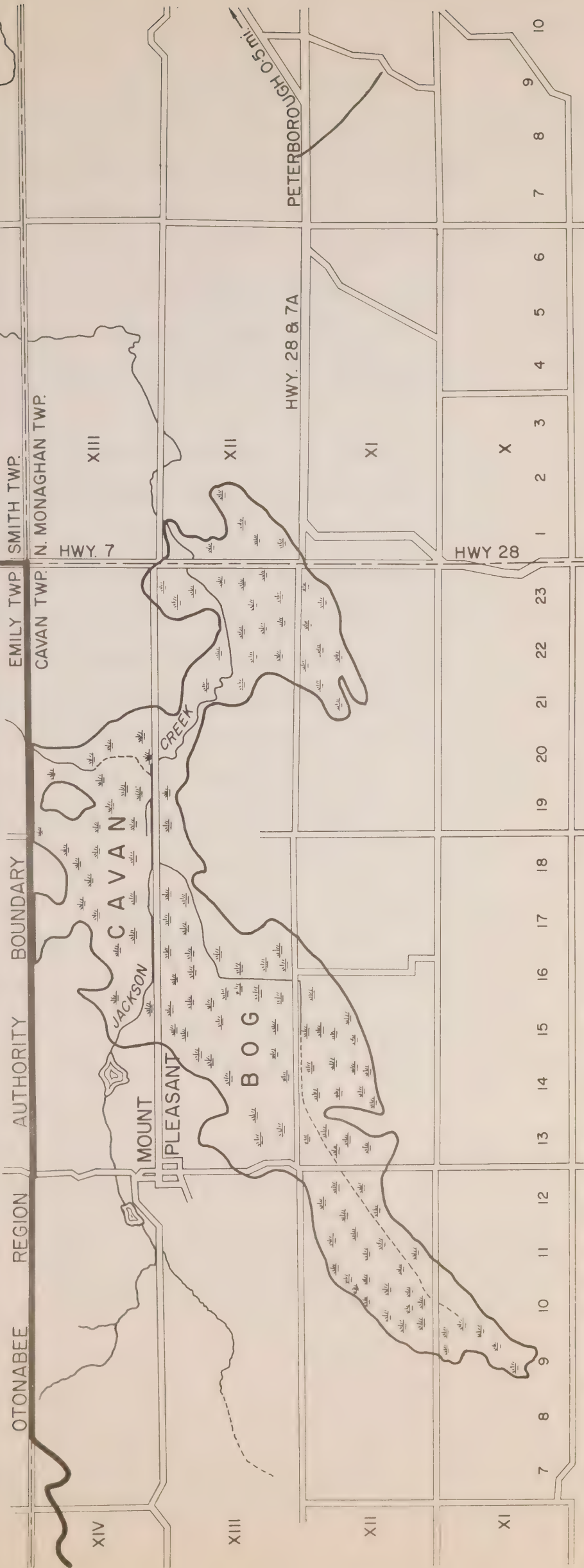
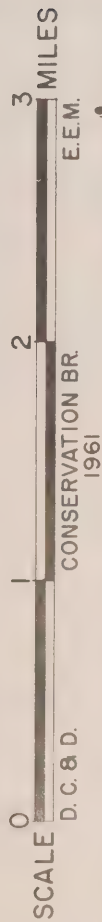
Bogs, swamps, marshes and other wetland areas are important land features of not only the Otonabee Watershed, but of most areas of the Province. Wetland areas may have value for wildlife, recreation, forestry and water conservation and flood control, and, if drained, sometimes for agriculture.

Although much is assumed little, unfortunately, is known about the actual condition and value of wetlands. For the purpose of collecting data on water, soil, forest and wildlife conditions in a wetland area, a detailed survey was made of Cavan bog. This particular wetland area was chosen because it was reasonably representative of wetland areas in the region, because of a certain amount of local interest in "the Bog", and also because of its accessibility and size. Cavan bog is only one of a number of wetland areas in these watersheds. Survey results and recommendation for this one will not necessarily apply to others in the region.

No previous surveys for which data are available have been done of Cavan bog. During the early 1950's some examination of the depth and character of the organic soils was made by commercial interests with the idea of using the area for agriculture. The plan however was never carried out.

The bog was examined during the summer of 1960 as part of the conservation survey of the watershed. The survey was designed to collect information on character and depths of

OTONABEE REGION CONSERVATION AUTHORITY



organic soil deposits, the type and quality of forest growth, plant life, and some idea of water relationships.

(c) Soil Materials

The soil material in most wetland areas is of an organic nature which has reached varying stages of decay. The depth and quality of this organic deposit is of importance when any consideration is being given to the agricultural uses of bogs.

To carry out the soil material survey, specially constructed augers were used. With them, it was possible to secure samples of the soil material to 12-foot depths. A grid of sampling points for the whole bog was laid out at intervals of 1,000 feet by 600 feet. The depth of organic material was measured at each sample point, and recorded on an aerial photograph. Also observed was information on depth of well-decomposed muck, and type of material underlying the organic deposits.

Within the limits of the bog as defined for the survey, the organic material varied greatly in depth. This variation ranged from an inch or so down to auger depth of 12 feet, and with an apparent maximum of 15 feet. While the depth of actual sampling was limited to 12 feet, a few probes were made to greater depth. These probes indicated the probable maximum depth of peat to be not greater than 15 feet.

For the purposes of this report "peat" and "muck" may be defined as follows:

"Peat" - undecomposed, or only slightly decomposed organic matter, accumulated under conditions of excessive moisture.

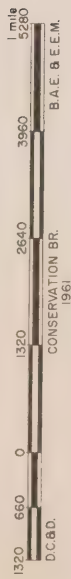
"Muck" - highly, decomposed organic material, often mixed with a considerable amount of mineral material, finely divided, and so decomposed that the fibrous plant remains usually found in peat are no longer distinguishable.

There is a layer of muck over the peat. This layer varies from 2 inches to 6 inches in depth, averaging about 4 inches. The peat is often quite woody in composition. In some sections of the bog it was difficult to sink the auger in more than a few inches without encountering buried woody

CAVAN BOG

SHOWING DEPTH OF MUCK AND/OR PEAT

SCALE IN FEET

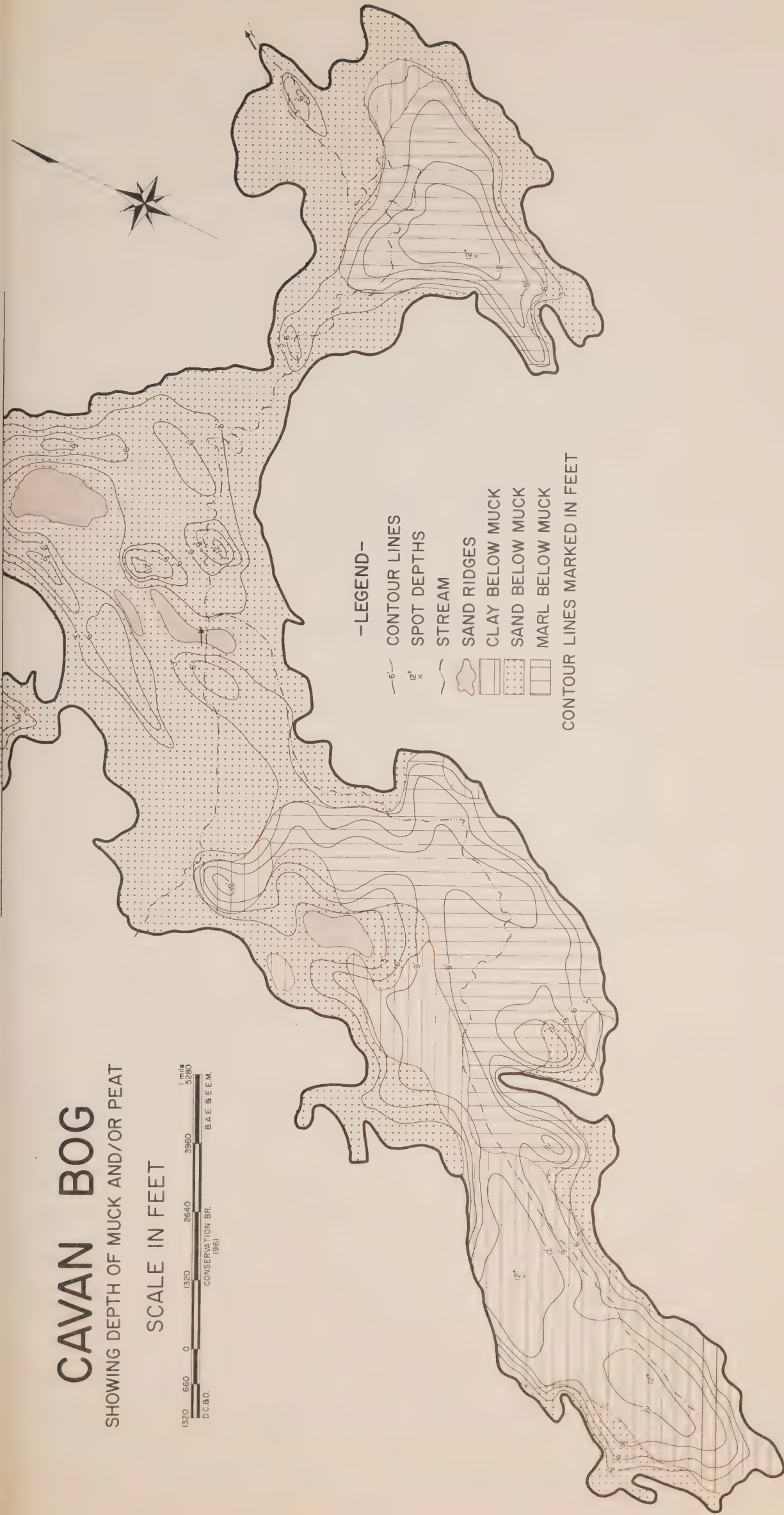


AUTHORITY

BOUNDARY

-LEGEND-

- CONTOUR LINES
- SPOT DEPTHS
- STREAM
- SAND RIDGES
- CLAY BELOW MUCK
- SAND BELOW MUCK
- MARL BELOW MUCK
- CONTOUR LINES MARKED IN FEET



materials. The colour of the peat varies from dark to light brown. In deeper deposits it gives off a noticeable odour of hydrogen sulphide ("rotten eggs") gas. This is a result of decomposition processes.

The reaction of the peat is neutral to very slightly acid.

The mineral soil underlying the peat is variable in type, being composed in different parts of the bog of either marl, clays or coarse sand. Marl is a soft earthy deposit consisting chiefly of limestone mixed with sand, clay or organic materials. It contains many small shells. Marl commonly underlies those sections of the bog where the peat deposits are deepest.

Cavan bog occupies the site of an ancient glacial lake. Glacial Lake Jackson was created by ice blocking a drainage course during the last ice advance. With the disappearance of the ice and the coming of growth thousands of years of vegetation have crowded in on the shore of the lake, died and sunk to the bottom and gradually built up the deposits of organic material. Each season growth spread further into the water from the shoreline until eventually the bog was formed.

2. Forestry

(a) Introduction

From the forestry point of view the Cavan bog area must constitute not only the large wet muck area of up to 3,000 acres, but an all-important fringe area which ranges uphill from the swamp proper. This fringe area has an "elastic" boundary, caused by past use of the surrounding farmland. Therefore the boundary of the fringe areas does not run continually and exactly parallel to the edge of the muck section.

Species content of the Cavan bog forest ranges from the wet lowland cover types to the dry upland types. At present the latter exhibits the greatest potential for quality timber.

(b) Past Use

At least one sawmill has operated off the Cavan bog since the turn of the century, or for at least fifty years, receiving the bulk of its material from the swamp forest. Its principal timber was in the form of elm and black ash, which was cut into lumber for furniture production. During this fifty-year period the supply gradually dwindled until, over the last 10 years, the mill became dependent on local custom sawing for its business. This supply also became too sporadic for profitable operation and the mill closed down two years ago.

However, use of the bog for forest products has continued. There is ample evidence of clear cutting in patches, mostly for firewood and fence posts. Here again the fringe forest has been affected on a continuous basis. No individual control of cutting methods appears to have been employed.

Considerable influence has been exerted on forest succession within the bog by cattle grazing. This has been detrimental since it has tended to remove valuable species such as maple from dry fringe areas.

It can be seen therefore that where human agencies have found sufficient footing to work on the "bog" forest the best timber has been removed, to be succeeded by the middle class timber, which has also been sporadically cut as it could be used. Each time the succession has tended to grow into a lower form of forest. Throughout the process, cattle grazing has increased the loss of the succulent, more valuable species produced by regeneration. The final result could only be a Cavan bog forest reduced to its lowest form.

(c) Species Content

(1) Main Bog Forests

Generally speaking, the forest cover types within the main body of the Cavan bog are an amorphous mixture of intermingling species combinations adapted to a moist site. This is in contrast to the normal marsh or wet-site forest.



The wooded nature of Cavan Bog is shown in this view.



This second growth poplar with some ground cover in the bog has little forest value.



Second growth cedar with no ground cover is typical of parts of Cavan Bog.

Although many species are represented, the key species in order are:-

1. Balsam poplar and the aspens
2. White elm
3. White cedar
4. Tamarack
5. Black ash
6. Black spruce
7. Balsam fir

The presence of the odd individual of other representative species also adds considerably to this list.

Tamarack as a cover type and with other inclusive species, occupies large areas of the west or southwestern section and a portion of the eastern section of the bog. In the central or main body of the bog it becomes a patchy constituent of the forest. The tamarack cover type is rarely heavily stocked.

The main body of the bog contains large portions of either poplar or elm as a cover type. Because each of these two species is a principal constituent of both cover types*, the boundary between type 4 (poplar) and type 60a (elm) must be considered arbitrary. Both cover types exhibit a good percentage of average and heavy stocking. Where both cover types are situated on a wet site, a substory of variably aged black ash will appear.

Amid the ranges of tamarack to elm and poplar types, one will encounter patch cover types of white cedar, each of which will have inclusions of black spruce and a small amount of balsam fir. Because isolated poplar and elm trees appear in these cover types (type 24), their definition as a pure conifer or mixedwood is also arbitrary.

Two other conditions are common in the cedar areas of the bog. Clear cutting of sections of a cedar cover type tend to cause "blowdown" of any of the remaining stand, and the piling of large amounts of coniferous "slash" over

* See Forestry Section of Report for explanation of cover types.

openings on the forest floor seriously inhibits the subsequent growth of coniferous regeneration and promotes a succession to a less desirable poplar coppice.

(2) The Fringe Forest

This forest exhibits no consistent cover type trend. There are areas of maple, beech, pine, hemlock and other admixtures. Because of the greater ease of operation as compared to the swamp forest proper, woodlots that have not been intelligently cared for are opening up, becoming weedy and are succeding to species of much lesser value. Again, local grazing methods are aiding the depreciation process.

On the north side near the town line there is one block of woods which was allowed to become over-mature so that valuable yellow birch, hemlock and basswood logs have been lost due to windthrow. Small sections of overgrazed second growth coppice are also common.

Conclusions

If it were reserved as a block of the proposed Otonabee Authority Forest, the Cavan bog would have certain benefits:

1. By providing long-term cover, the preservation of a valuable water-source area will be aided.
2. Being under the control of one agency, exploitation of the bog can be done with moderation over a longer period of time.
3. If experimentation is needed to discover sounder harvesting techniques in swamp forest, such experiment can be performed without damage to the over-all larger stand. The owner of a small property cannot do this, as a harvesting experiment may use up too high a percentage of his holding.
4. Its present species composition can be gradually changed to one of greater over-all use and therefore of higher value.

Recommendation

That 2,500 acres of the Cavan bog be acquired as part of the Otonabee Region Conservation Authority Forest. These areas are illustrated on the recommended Authority

Forest map in the Forestry section of the Otonabee Region Conservation Authority report.

List of properties recommended for acquisition as Authority Forest in the Cavan bog.

Concession	Lot Descriptions	Acres
12	N $\frac{1}{2}$ Lots 12, 13, 14 and 15	400
12	All of Lot 11	200
12	S $\frac{1}{2}$ Lots 9 and 10	200
13	S $\frac{1}{2}$ Lots 13, 14 and 22	300
13	All of Lots 15, 16 and 23	600
14	S $\frac{1}{2}$ Lots 15, 16, 17 and 18	400
	All of Lots 19 and 20	400
		2,500

3. Wildlife and Wild Plants

Bogs and swamps in Southern Ontario vary greatly in their soil and water conditions, and hence vary greatly both in their capacity to attract and harbour wildlife and in their ability to produce unusual and interesting vegetation.

The soils of this bog and the major forest types have already been described in this report. The following summary describes only the habitat for wildlife of the bog in the summer of 1960, the animals which are believed to be present, and most of the more interesting wild plants which are known to be present.

(a) Birds

(1) Game Birds

It is extremely unlikely that waterfowl would make any extensive use of the limited water areas in the Cavan bog. No doubt Black Ducks, Mallards and Blue-winged Teal occasionally use the pond near Mount Pleasant, and no doubt they use the streams in the Cavan bog at times. Wood Ducks might use some of the few small ponds, but this seems unlikely, as larger bodies of water with nearby nesting-holes in poles or trees would be much more attractive. The Ruffed Grouse is not an

uncommon species. When in an isolated area, such as this one is, it is possible that the species is not cyclic in numbers. Pheasants do not appear to have survived the several introductions. Many edges of the swamp make ideal grounds for the American Woodcock, which is undoubtedly present. The Common Snipe can be expected to occur rarely in several of the more open sedge meadows.

(2) Bird List

The following list includes 99 species which, from the evidence of their presence in Peterborough County, and from the nature of the Cavan bog and the adjacent meadowland, may be expected at some time of the year in the area of the Cavan bog. Some of these will of course be seen only in migration. Very rare species are not included.

American Bittern	Black-capped Chickadee
Turkey Vulture	White-breasted Nuthatch
Sharp-shinned Hawk	Red-breasted Nuthatch
Cooper's Hawk	Brown Creeper
Red-tailed Hawk	House Wren
Red-shouldered Hawk	Long-billed Marsh Wren
Broad-winged Hawk	Short-billed Marsh Wren
American rough-legged Hawk	Catbird
Marsh Hawk	Brown Thrasher
Sparrow Hawk	Robin
Ruffed Grouse	Wood Thrush
American Woodcock	Hermit Thrush
Common Snipe	Veery
Mourning Dove	Golden-crowned Kinglet
Black-billed Cuckoo	Ruby-crowned Kinglet
Screech Owl	Cedar Waxwing
Great Horned Owl	Northern Shrike
Barred Owl	Loggerhead Shrike
Whip-poor-Will	Starling
Ruby-throated Hummingbird	Red-eyed Vireo
Belted Kingfisher	Warbling Vireo
Yellow-shafted Flicker	Black-and-white Warbler
Pileated Woodpecker	Nashville Warbler
Yellow-bellied Sapsucker	Yellow Warbler
Hairy Woodpecker	Magnolia Warbler
Downy Woodpecker	Myrtle Warbler
Arctic Three-toed Woodpecker	Black-throated Green Warbler
American Three-toed Woodpecker	Blackburnian Warbler
Eastern Kingbird	Chestnut-sided Warbler
Crested Flycatcher	Bay-breasted Warbler
Eastern Phoebe	Pine Warbler
Least Flycatcher	Oven-bird
Eastern Wood Pewee	Northern Waterthrush
Tree Swallow	Yellowthroat
Bank Swallow	Canada Warbler
Rough-winged Swallow	American Redstart
Barn Swallow	House Sparrow
Blue Jay	Bobolink
Crow	Meadowlark

Red-Wing
Baltimore Oriole
Grackle
Cowbird
Scarlet Tanager
Indigo Bunting
Evening Grosbeak
Purple Finch
Pine Grosbeak
Common Redpoll
Pine Siskin

Common Goldfinch
Vesper Sparrow
Slate-coloured Junco
Tree Sparrow
Chipping Sparrow
White-crowned Sparrow
White-throated Sparrow
Swamp Sparrow
Song Sparrow
Snow Bunting

(b) Mammals

Game and Fur

The following species of game and fur-bearers are present in the Cavan bog.

WHITE-TAILED DEER	A common species. However, it should be noted that there has not been an open season for deer in Durham County, which includes Cavan Township, in recent years.
BRUSH WOLF	The brush wolf may be expected to occur in the Cavan bog, although it is seldom seen.
RACCOON SKUNK BEAVER	There are several colonies of beaver and several new beaver dams were seen during the survey.
MUSKRAT	Muskrat burrows are common along Jackson Creek.
MINK	Tracks were seen on several occasions along Jackson Creek.
SNOW SHOE HARE	The area is well within the range of the snow shoe hare, but none were seen on the survey.
COTTONTAIL	This species is common on the fringes of the bog.

Other Species

PORCUPINE	The porcupine, which cannot be classified as either game or fur, is an interesting species but one which does considerable damage to coniferous tree species and often requires control in plantations or woodlots.
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Besides the above species, there are probably five species of shrews, two species of moles, six species of bats, four species of squirrels and eight species of mice, which may all be expected in the Cavan bog. Additional possible species include the otter and the bobcat, which might at times frequent this bog.

(c) Wild Plants of the Cavan Bog

The flora of the Cavan bog has long been known to be of exceptional interest to botanists, and to a lesser degree, to the general public. So far as is known, no systematic intensive study of the flora of the bog has been made by professional botanists. However, many entirely capable amateur botanists, chiefly members of the Peterborough Nature Club, have examined and photographed the rare species known to be in the bog.

It is impossible to say how much change there has been in the water conditions, the soil conditions or the resulting vegetation as a result of the cutting of timber species, principally elm and black ash, for lumber during the last century. There has been some clear cutting and occasional grazing. The ground vegetation must in some areas, have been radically changed. More than eight miles of roads and cleared road-allowances pass across the bog, and at least three drainage ditches have been dug. These of course, have had some effect on the vegetation and water levels.

The extent of sphagnum bog (which is frequently found in association with tamarack and black spruce) was not measured on the summer survey, but there are several areas of sphagnum in the south-eastern section of the bog and small scattered patches elsewhere.

The following list of flora is of course not a complete one, since it does not include the hundreds of species of grasses and sedges and other relatively uninteresting plants.

The late Frank Morris*, first drew attention to the unusual varieties of orchids which grew in the Cavan bog. However, he was careful not to mention the exact localities or stations for the rare species.

* Morris, Frank; and Edward Eames, "Our Wild Orchids", Scribners, 1929.

LIST OF ORCHIDS FOUND IN THE CAVAN BOG

Cypripedium arietinum	Ram's Head Lady's Slipper
" pubescens	Large Yellow " "
" parviflorum	Small Yellow " "
" reginae	Queen " "
" acaule	Stemless " "
Habenaria hyperborea	Tall Northern Green Orchid
" dilatata	Tall White Bog Orchid
Orchis rotundifolia	Small Round-leaved Orchis
Pogonia ophioglossoides	Rose Pogonia
Calopogon pulchellus	Calopogon
Spiranthes cernua	Nodding Lady's Tresses
Spiranthes Romanzoffiana	Hooded Lady's Tresses
Arethusa bulbosa	The Arethusa Orchid
Malaxis unifolia	Green Adders Mouth
Corallorhiza striata	Striped Coral Root
" maculata	Spotted " "
" trifida	Early " "
Habenaria clavellata	Green Wood Orchid
" obtusata	Blunt-leaved rein orchid
Malaxis monophyllum	White Adder's Mouth

PARTIAL LIST OF OTHER FLOWERS IN THE CAVAN BOG

Sarracenia purpurea	Pitcher Plant
Kalmia polifolia	Swamp Laurel
Lobelia Kalmii	Kalm's Lobelia
Trientalis borealis	Star Flower
Cornus canadensis	Bunchberry
Ledum groelandicum	Labrador Tea
Moneses uniflora	One-flowered Pyrola
Andromeda glaucophylla	Bog Rosemary
Pyrola elliptica	Shinleaf
Pyrola rotundifolia	Wild Lily-of-the Valley
Mianthemum canadense	False " " " "
Eriophorum opacum	Cotton Grass
Iris versicolor	Blue Flag
Clintonia borealis	Clintonia
Linnaea americana	Twinflower
Vaccinium oxycoccus	Small Cranberry
Mitchella repens	Partridge Berry
Senecio aureus	Golden Ragwort
Valerian Sylvatica	Valerian
Tiarella cordifolia	Foam Flower
Mitella diphylla	Bishop's-Cap Miterwort
Mitella nuda	Naked Miterwort
Menyanthes trifoliata	Buckbean
Utricularia cornuta	Yellow Bladderwort
Potentilla argentea	Silvery Cinquefoil
Viola canadensis	Canada Violet
Viola blanda	Sweet White Violet
Viola cucullata	Marsh Violet
Viola rostrata	Long-spurred Violet
Aronia melanocarpa	Black Chokeberry
Typha latifolia	Broad-leaved Cat-tail
Arisaema triphyllum	Jack-in-the-pulpit
Oenothera biennis	Evening Primrose
Eupatorium purpureum	Joe-pye Weed
Asclepias syriaca	Milkweed
Claytonia caroliniana	Wide-leaved Spring Beauty
Cerastium arvense	Chickweed
Circaea canadensis	Enchanter's Nightshade
Solanum dulcamara	Bittersweet
Aquilegia canadensis	Wild Columbine
Clematis Virginiana	Wild Clematis
Echinocystis lobata	Wild Cucumber
Hypericum perforatum	Common St. John's-Wort
Anemone canadensis	Anemone
Ranunculus septentrionalis	Marsh Buttercup

<i>Thalictrum dioicum</i>	Early Meadow Rue
<i>Thalictrum polygamum</i>	Fall Meadow Rue
<i>Spiraea tomentosa</i>	Hardhack or Steeplebush
<i>Fragaria virginiana</i>	Wild Strawberry
<i>Fragaria vesca</i>	Wood Strawberry
<i>Geum strictum</i>	Yellow Avens
<i>Geum rivale</i>	Water Avens (Purple)
<i>Geranium robertianum</i>	Herb Robert
<i>Geranium maculatum</i>	Wild Geranium
<i>Impatiens biflora</i>	Jewelweed
<i>Apocynum androsaemifolium</i>	Spreading Dogbane
<i>Prunella vulgaris</i>	Self-Heal
<i>Hieracium aurantiacum</i>	Orange Hawkweed
<i>Galium asprellum</i>	Rough Bedstraw
<i>Anaphalis margaritacea</i>	Pearly Everlasting
<i>Erythronium americanum</i>	Yellow Dog's-tooth Violet
<i>Myosotis scorpioides</i>	Forget-me-not
<i>Achillea millefolium</i>	Yarrow
<i>Sium pusilla</i>	Water-parsnip
<i>Drosera rotundifolia</i>	Round leaved Sundew
<i>Caltha palustris</i>	Marsh Marigold
<i>Coptis groenlandica</i>	Goldthread

There are also at least forty-four species of trees and shrubs in the Cavan bog, including such unusual and interesting species as the northern dwarf birch, mountain holly, nannyberry and highbush cranberry.

Almost all of the species mentioned can be found in the south-east lobe of the main Cavan bog. This area, approximately 340 acres in extent, is a unique mixture of marsh, wet woodland, sphagnum bog and quaking bog.

A careful appraisal of the above lists shows that, while the birds and mammals of the Cavan bog are those which would be expected to occur in such an area, the wild plants, and particularly the orchids, form a very remarkable collection and one which probably cannot be duplicated in such a small area anywhere in the province. Where rare plants are concerned, there is always a question as to whether it is a disadvantage to draw the attention of the public to the location, through its acquisition by a public body, or to leave the area under its present ownership; and thus to leave the general public unaware of the location, and therefore less likely to disturb it. However, almost all of those who are interested in rare and unusual plants, already know of this bog. It therefore appears to be in the public interest that the area should be in



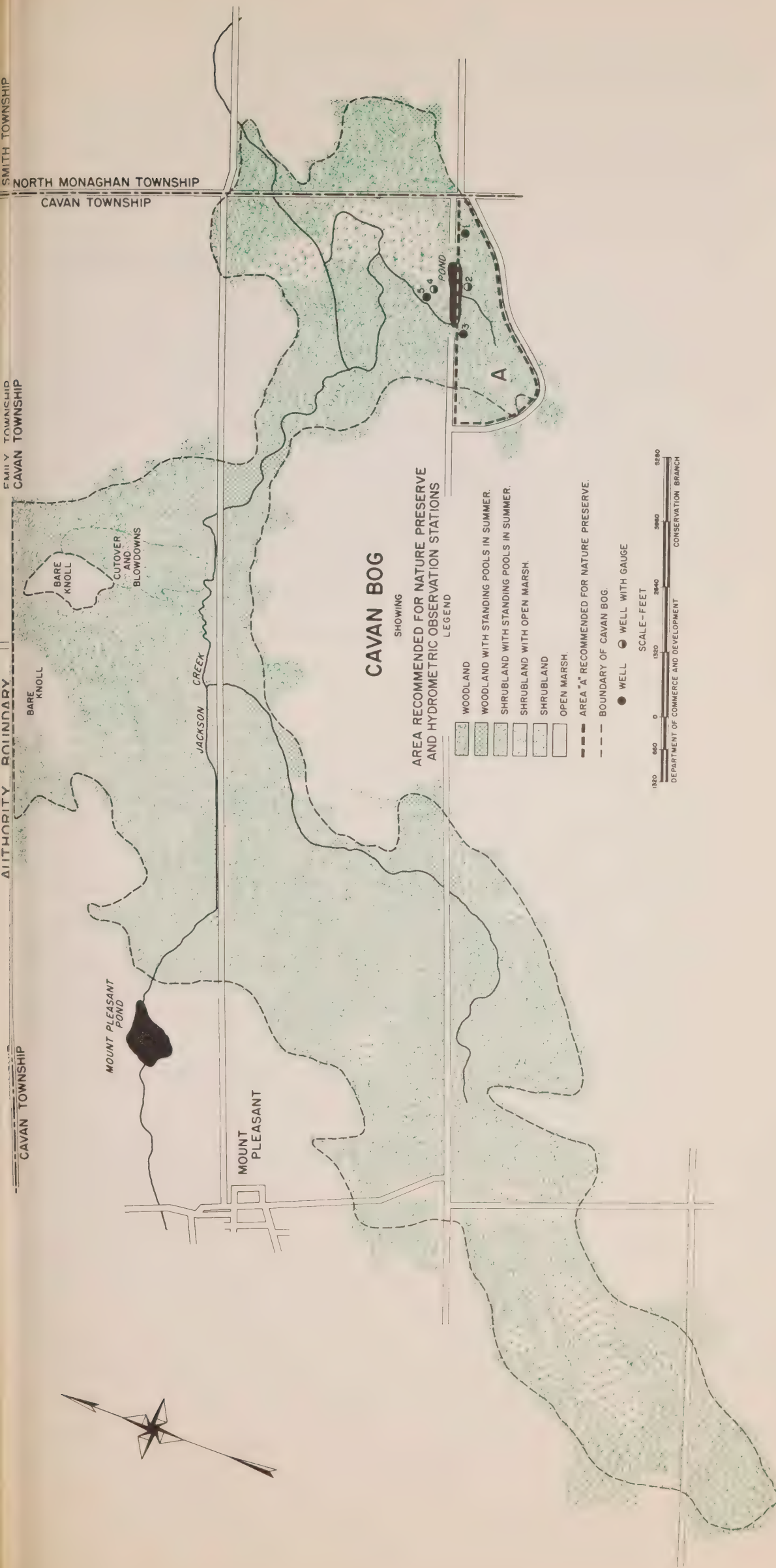
Only a small part of Cavan Bog can be described as a "quaking" bog. Plants typical of such wet conditions are found.



The tall, white bog-orchid (*Habenaria dilatata*, Pursh.) is found in the area.



Measuring the depth of one of the few patches of open water in the bog.



CAVAN BOG

SHOWING
AREA RECOMMENDED FOR NATURE PRESERVE
AND HYDROMETRIC OBSERVATION STATIONS

LEGEND

- WOODLAND
- WOODLAND WITH STANDING POOLS IN SUMMER
- SHRUBLAND WITH STANDING POOLS IN SUMMER
- SHRUBLAND WITH OPEN MARSH
- SHRUBLAND
- OPEN MARSH
- AREA "A" RECOMMENDED FOR NATURE PRESERVE
- BOUNDARY OF CAVAN BOG

● WELL ● WELL WITH GAUGE

SCALE - FEET



public hands. The following recommendation is therefore made, and is adjusted to complement the recommendations in the Forestry section of this report.

Recommendation

It will be noted that in the Forestry Report on the Cavan bog, all of Lot 23 and the south half of Lot 22 of Concession XIII are recommended for acquisition as Authority Forest. There are many unusual species of plants in this particular area but it appears from the survey, and from observations made by members of the Peterborough Nature Club that the area of the bog in Concession XII (north of the new road which skirts the bog) is of even greater importance botanically. It is therefore, recommended that this southern section should be acquired by the Conservation Authority as a Nature Reserve or Conservation Area, quite separate from those areas useful for agriculture or forestry. The recommended area is shown on the accompanying map.

In this particular case, the importance of leaving the area undisturbed would seem to outweigh the importance of its management for forestry purposes. Too great a disturbance of the forest cover now on the area might easily result in a serious blow-down condition.

4. Water-Balance Study

A pilot study on the water-balance of Cavan bog was undertaken during the summer of 1960 to obtain information on water consumption and loss from the swamp, and as a means of examining the problems involved in observational procedure and instrumentation for such a study.

The variations of the water-table in a swamp are an integration of the complex relationship between precipitation, evaporation, transpiration, run-off and seepage. While each of these items plays an important role in the water-balance



On the man's left is a plastic rain gauge, and to his right, a pipe to measure ground water levels in the Cavan Bog.



Measuring depths of organic deposits with a special auger in the Cavan Bog.

of the swamp, the individual effect of each item is extremely difficult to assess. It was felt that by establishing a project even on a limited basis, it would be possible to obtain an indication of the quantities of water lost from the swamp and the necessary instruments for the observations.

From late in June, through summer and fall, rainfall amounts and the height of the water-table were recorded at twice weekly intervals in the south-west corner of Cavan bog, over an area of about 100 acres (Fig.1). These data are plotted on the accompanying chart (Fig.2).

The study area was located adjacent to the pond on the submerged section of the concession road, between Concessions XII and XIII, Cavan Township, at Lot 22. Well No.2 was only 40 feet from the pond, while the other four wells ranged from 150 feet to 800 feet away. (see Fig.1 and picture of observation site).

The ground cover over the study area was primarily cedar, with dogwood and other shrubs in the more open sections. The depth of the peat varied from 12 to 15 feet. More detailed descriptions of the ground cover and soil types are given in the sections of the Cavan bog report, dealing with these features.

(a) Instrumentation

The wells consisted of 3-foot lengths of 6-inch diameter metal stove pipe set down $2\frac{1}{2}$ feet into the peat. The pipes were perforated throughout their length, and care was taken to ensure that the peat around the pipe was not disturbed any more than necessary to insert the pipe. The depth of the water-table was measured with a ruler from the top of the well-pipe.

As a means of checking on the stability of the well casing through the season, 12-foot metal posts were driven down the centre of wells No.2 and No.4, until the tops

of the posts were level with the top of the well-pipe. No apparent changes in level were noted during the period of observation.

Two wedge-shaped plastic rain gauges were installed at wells No.2 and No.4, as a means of sampling the rainfall over the area. Differences in amounts between the two gauges were very small.

A plywood weir was installed near well No.5 in the small watercourse which drains the pond on the concession road. The soil, however, was unsuitable for a structure of this type, and a washout occurred before measurements of the discharge could be taken.

(b) Results

The well records for wells No.1, 3, 4 and 5, showed a marked similarity in pattern. Consequently only the plot for one of these, well No.4, is shown in Fig.2. Well No.2, being close to the pond, did not show as great a change as the other wells and is, therefore, shown on the chart.

The rainfall amounts shown on the chart, were obtained from the twice-weekly readings, and apportioned on the basis of daily rainfall observations, taken at two sites in Peterborough.

A few water-level readings were taken in October, November and early December, after the survey party had left the area. The rainfall at Peterborough was plotted for this period, to indicate the pattern over the area.

The rainfall over the swamp for the period, June 20 to September 30, was 4.6 inches, occurring in amounts of $\frac{3}{10}$ to $\frac{5}{10}$ inch at 3- to 5-day intervals, in the latter part of July and through August.

The water-table showed a general downward trend, from the beginning of observations, until the lowest level was reached in the third week in September. The affect on the water-table of rains of 0.4 inch or more, is quite noticeable.

It must be pointed out, however, that the total volume of water causing these rises in the water-table, may be quite considerably more than the indicated rainfall over the swamp, as the swamp is surrounded by drumlins, which extend the area of the watershed beyond the boundary of the swamp soil.

In the period June 20 to September 22, the total rainfall was 4.3 inches and the total drop in water-table averaged over the five wells was 19 inches. If it is assumed that the water-table in the swamp changes 6 inches for 1 inch of rain, as was found in Bradford Marsh*, the decrease in the water-table would be a water loss and consumption of 3.2 inches. This would be a total loss of water from the swamp of approximately 7.5 inches. In view however of the extended area of the swamp watershed, the water consumption and loss from the swamp by evapo-transpiration, run-off and seepage computed on drainage from the whole basin, is no doubt much greater than 7.5 inches.

Rainfall of about 1 inch at the end of September and beginning of October caused a slight recovery in the water-level. During the next three weeks of October, in which no rain occurred, there was little or no change in the water-level. This would indicate that evapo-transpiration at this period of the year is at a very low level in comparison with rates prevailing during the summer months.

The water-levels began to climb in early November as a result of rains, levelling off at a few inches below the near capacity values which prevailed at the beginning of the study period in late June.

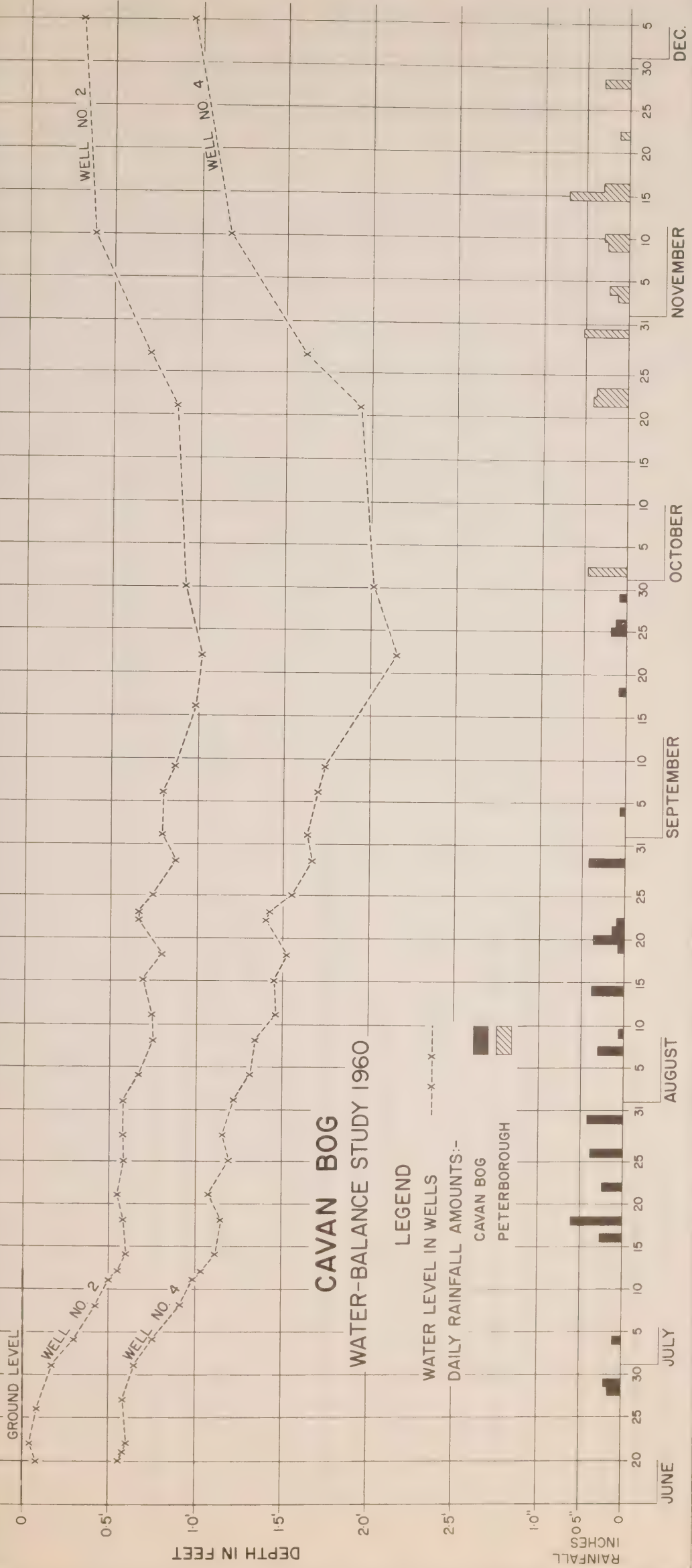
(c) Rainfall Records

The climatic pattern of a region is an important factor in assessing the results of water-balance studies. In

* Personal communication, L.J. Chapman, Ontario Research Council.

1960

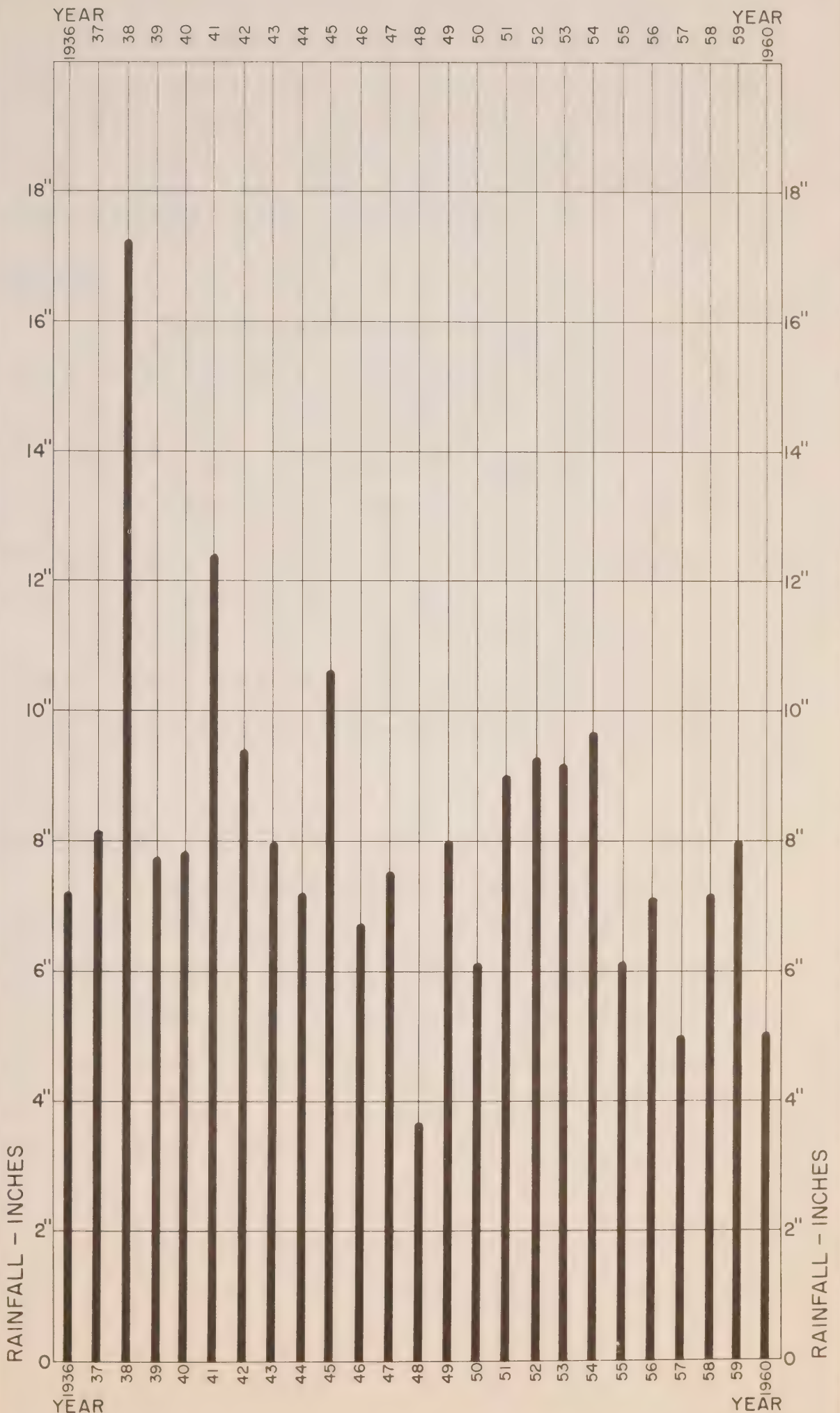
JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DEC.



RAINFALL AT PETERBOROUGH

FOR THREE MONTH PERIOD

JULY,AUGUST,SEPTEMBER



order to correlate the 1960 data with general conditions for the area, a review was made of the rainfall amounts at Peterborough for the three months, July, August, September, during the past 25 years, 1936-1960 (Fig.3). The average for this period is 7.8 inches, with a range of 13.6 inches from a low of 3.7 inches in 1948 to a high of 17.3 in 1938. The 1960 amount of 5.0 inches is, along with 1957, the second lowest reading indicating an abnormally dry year.

Conclusions

Limited observations of rainfall and water-level during one summer in a small section of Cavan bog, cannot be expected to supply definitive results on the water-balance of the area. The data however would suggest that the loss of water from the swamp through evapo-transpiration, run-off and seepage, can in dry years be of considerable magnitude in relation to the available water supply.

A more detailed observational program and instrument network than that undertaken in this pilot study is necessary, if specific data are required on the water-balance of swamps.

Recommendations

A detailed knowledge of the water-balance of swamps must be obtained, before a comprehensive watershed management plan can be fully established on the many river basins of Southern Ontario in which swamps are a major feature of the physiography. This study has indicated that factual results are obtainable only through an extensive and well-instrumented observational program, operated without interruption over a period of years.

Research into the water-balance of swamps has been established along these lines of intensive study in other

countries*, and an adaptation of these methods would supply many tangible results.

On this subject, the 1960 Annual Report of the United States Lake States Forest Experiment Station (2) states,

"Conflicts for the use of land and the water resource are developing. Yet one knows the value of these areas (swamps), as a source of ground-water recharge, or as a stabilizing influence on streamflow. Basic to an understanding of the local hydrology is a knowledge of bog hydrology".

The Manual of Hydrometeorological Observations in Swampland†, issued by the U.S.S.R., confirms this opinion, by stating

"The only means of solving these problems (the role of swamplands in the water-balance of a given region) is the establishment of hydrometeorological stations in swamplands, to observe all components of heat and water balance, under natural conditions".

* Weitzman, Sidney, Watershed Management. 1960 Annual Report. Lake States Forest Experiment Station, U.S. Dept. of Agriculture, St. Paul, Minnesota.

† Manual of Hydrometeorological Observations in Swamplands, U.S.S.R. Hydrometeorological Service translated by Meteorological Branch, Canada Dept. of Transport, 1960.

CHAPTER 7

THE AUTHORITY AND A SOIL CONSERVATION PROGRAM

1. Land Use Programs of Other Authorities

There are 30 Conservation Authorities (as of March 1961) in Ontario. Most of them have to varying degrees promoted soil conservation and land use management. Their programs vary, of course, with the location of the Authority and with the urgency of such problems as flood control.

The paragraphs below summarize land use and forest conservation programs of Authorities in Ontario. This outline is presented here as a review of the possibilities rather than as a recommendation to the Otonabee Authority of other Authorities' programs.

(a) Farm Ponds

Fifteen Authorities have farm pond assistance programs. Through them they encourage the construction of ponds for conservation purposes on privately owned land.

Most Authorities provide technical assistance and advice on pond construction and location. This advice is available from Authority staff, or from the Department of Agriculture. One Authority retains the services of a professional engineer for pond surveys.

All Authorities with pond assistance programs have regulations to govern pond construction. These regulations cover minimum size, depth, fencing, etc.

Most Authorities give some financial assistance towards the building of ponds. Such assistance varies from a straight \$50 per pond, to a sliding scale of subsidies based on pond capacity, with a maximum of \$300 for a pond of over 3 acres.

(b) Tree Planting

Nineteen Authorities have active forestry programs. A number of Authorities own tree planters which are available for rent to private landowners. Several Authorities

also supply tractors and men to operate them. There is usually a charge for this service, often about one-half the actual cost.

(c) Authority Forests

Fourteen Authorities have established Authority Forests. They are established on marginal and sub-marginal land, Classes V, VI and VII; land that is usually unsuited to agriculture. Private landowners are often not in a position to return sub-marginal land to trees. Where reforestation is determined to be the most suitable use for such land, it can often be done best under public ownership.

(d) Grass Waterways

Several Authorities promote the construction of grass waterways on private land by offering financial assistance toward their construction. The amount of assistance varies, and may go as high as \$150 per farm.

(e) Demonstrations

Several Authorities have used demonstrations as an effective means of illustrating the values of certain land-use practices. These demonstrations have been carried out in several ways. One method is to demonstrate a specific land-use improvement on privately owned land. This may be the building of a grass waterway, or a drainage project, or a farm pond. The landowner involved usually receives some financial assistance on the project in return for use of this land as a demonstration.

Several Authorities have purchased property for specific use as demonstration farms. The Grand Valley Conservation Authority owns a 50-acre farm in the lower end of the watershed near the town of Caledonia. On it they have carried out reforestation, pasture improvement, built a pond and constructed gully control works. The Saugeen Valley Authority purchased and operates a pasture demonstration farm. This farm is located on land in Grey County that tends towards the marginal for agriculture. Various soil management measures and seed mixtures are used and the intensity of grazing is controlled.

Most of the Authorities that have established "Conservation Areas" carry out land-use demonstrations on them. These demonstrations have value to both urban and rural visitors. Reforestation, pasture management, farm ponds, gully control and grass waterways are well known management practices that can be shown to visitors, and give Conservation Areas good reason to be called multiple purpose areas.

Demonstrations are carried on in co-operation with local farm organizations and the Department of Agriculture.

2. Land Use Program in the Otonabee Authority

Fertility, drainage and erosion, often in that order, are the main soil management problems facing landowners. It is essentially the responsibility of the landowner to recognize and overcome these problems on his own land. Soil reports, conservation reports, and other material is available to inform him, but he must see the problem in his own area, and know how to overcome it, or where to get assistance. His management practices will be guided by his interests, experience and by economic conditions.

An Authority can hope to carry out by itself only a small portion of the conservation work needed in a watershed. Any conservation program must first deal with people before it deals with land. Particularly is this true of soil conservation measures. An Authority can be most effective in a soil conservation program by interesting, informing and showing landowners the problems and the benefits of good soil management. To a small extent an Authority may also assist financially, e.g., by providing some financial aid in gully control or grass waterways.

The Department of Agriculture and the Ontario Agricultural College are primarily given the responsibility for advising farmers in soil problems. Their assistance is quite varied, ranging from soil test and fertilizer recommendations to lay-out of farm ponds and the planning of crop rotations. The Agricultural Representative, and the extension specialists in

soils, crops and engineering are available without cost to advise and assist farmers with their problems. It is by working with these specialists and with their departments that a Conservation Authority can be most effective in a land-use program.

A soil conservation program of an Authority should complement existing services. Demonstrations, projects, exhibits and tours can be worked out with the agriculturalists. An Authority can often provide them with facilities, and sometimes funds, not usually available to them. The Authority could, for example work out a soil management demonstration in a Conservation Area, with the Department of Agriculture providing land for this purpose that might not otherwise be available.

Limited financial assistance, when given to aid in the construction of farm ponds, or grass waterways or gully control, can often provide the incentive needed to persuade a landowner to undertake a recommended measure. An Authority can use its funds, staff and facilities for publicity and education on the benefits of good land management. Tours, exhibits, booklets and school projects can be worth-while parts of a soil conservation program.

An Authority's role in soil conservation is more that of co-operation, rather than initiation. When an Authority has an active overall conservation program, the soil and land-use portion of it may seem minor. Soil conservation is influenced, more than any other aspect of a conservation program, by factors outside the control and jurisdiction of the Authority. The purchase of land for forestry, or for recreation, or the building of structures for water control are Authority projects immediately recognizable. Improving the use and management of farm lands is essentially educational; it is long-range and it often seems very slow. Nevertheless seemingly minor projects may have many long-range values.

FOREST

CHAPTER 1

THE FOREST IN THE PAST

1. At the Time of Settlement

Good early descriptions of the forests of Southern Ontario are rare. In many areas however, a reasonable picture can be pieced together from notes of the surveyors who laid out the townships in preparation for settlement, for their instructions read as follows:

"Your field book is to be kept in the accompanying form, comprising the kind and quality of the soil and timber, entering each kind of timber in the order of its relative abundance".

By the time the surveys were underway, lumbermen, with or without official sanction and others perhaps even earlier, had already changed the forest conditions greatly. Generally the watershed was covered with maple, beech, basswood and oak stands particularly on the better soils.

Pine occurred mostly in a scattered form throughout the watershed. On the sandy and more gravelly deposits it tended to replace the principal hardwoods as a stand constituent. Elm was an important species in the original surveys where the site was more moist.

The remaining area was made up of swamps both hardwood and coniferous with quantities of useful cedar and some patches of black ash being noted down in the old surveys.

2. Clearing the Land

The usual course of settlement in Southern Ontario involved the destruction of the forest as rapidly as possible to make way for agricultural crops. While pine for building and hardwoods for fuel were important to the settler, their abundance prevented any concern for their preservation. Most of the forest was just a nuisance and was simply piled and burned or licensed for cutting to lumbermen.

In 1840 during his inspection and evaluation

trips to settled lots of Otonabee Township, Thomas J. Dennehey, later road surveyor for the Colborne District, stated of Lot 17, Concession I:

"This lot has been plundered of the pine by lumbermen."

And of Lot 18, Concession I:

"There had been some red pine on this, the lot has been plundered of the best of its timber".

Of Lot 19, Concession I, he said:

"This lot has been denuded of its best timber, and now there is on this lot a very large windfall, which will make it difficult ever to clear".

3. Forest Products

The earliest interest in timber in Ontario was the reservation of pine and oak either by specified areas or by individual marked trees for the use of the British navy. The square timber trade, which commenced somewhat later and was carried on simultaneously with the mast trade from the 1830's, was likewise very selective as to species and quality.

Square timber was obtained by selecting large trees, mostly white pine, and squaring the best part into one long stick. In the earliest days of the industry the timbers were squared on all four sides to a fine "proud edge", but later, when the best timber had been cut, they were squared with a rounded shoulder or "wane", and were known as "waney timber". Such methods, of course, were wasteful since the finest grained wood was sacrificed in the operation, but this was the type of material called for by the British market.

"Often only one tree in a thousand would yield a finished 'stick' (so was the heavy square timber nonchalantly called in the trade) fit for export. A good stand might yield thirty or forty trees an acre for over the whole area allowance had to be made for 'wants' - the non-bearing patches of swamp, burn, etc. Today a whole township or limit (in Northern Ontario) may not have one good square stick of the quality of the square timber of another day."*

* A Hundred Years A-Mellin', written for Gillies Bros. Ltd., by Miss Charlotte Whitton.



One of the last white pine stands on the Otonabee watershed — situated at Young's Point.



The same stand showing the tree size reached in under 100 years.



One of the last white pine stands on the Otonabee watershed — situated at Young's Point.



The same stand showing the tree size reached in under 100 years.

Until 1890 the Census of Canada lists all pine and oak not sawn into lumber as "square timber", and even as late as 1910 most species are listed as "square, waney or flattened".

From the account of early Peterborough history by T.W. Poole we learn that as early as 1838, a Mr. Hickson removed a quantity of white pine spars from the vicinity of Buckhorn Lake.

The relationship between the period of original forest examination by surveyors and the conservation survey of 1960 appears significant in the description of present forest condition on the Otonabee.

For example, both Birdsall and Wilmot in their surveys of Otonabee, Cavan, North and South Monaghan Townships repeatedly stressed the observation of stands of good white oak. These stands generally occupied a large oval area surrounding the southernmost slopes of the Otonabee River and the northern shores of Rice Lake.

In 1819 Birdsall, in running the line between Concessions II and III of Otonabee Township at what is now Lot 14, writes of crossing a stand of "black and white oak, white and yellow pine. Some person has taken a quantity of lumber from the place".

In 1820 in a letter to the Surveyor-General regarding the town plot at the mouth of the Otonabee he wrote:

"The interior of the Town Plot is in general a white Oak plains".

Later in the year he wrote:-

"the reason I pitched on this place was that it is the best situation on account of the fine rise of land to the North and rise quite gradually the land quite dry and covered with fine White Oak."

Wilmot, in his survey of 1817, around what is now the Bewdley area, discovered "a lot of useful timber in white oak form."

It is significant therefore to note that at present this white oak population, as an important constituent of three established forest types, has been reduced to 0.4 per cent of Cavan Township, 0.9 per cent of Otonabee and 0.6 per cent of South Monaghan. All of this remaining white oak lies in the same general Rice Lake area, as discovered by both Birdsall and Wilmot but only occupies part of 200 acres of scattered farm woodlot cover types.

The same principle may be applied to the depletion of basswood supplies. In the examination of the original surveys, there are noticeably repetitious observations of maple, beech, elm, basswood, - maple, beech, basswood, - and maple, beech, pine, basswood, as species combinations in stand form. The frequency of these observations proves that originally basswood was a most important component of the forest on the better land sites.

As a comparison, basswood at present forms part of two principal forest types in the Otonabee region, sugar maple - basswood and red **oak** - basswood - white ash.

Considering this species as a major component of the above types, the population of basswood has therefore been reduced to 0.98 per cent of existing forest cover since 1817. It therefore assumes relative importance on 312 acres only on the watershed.

As settlement and trade grew, sawmilling increased and the rivers became important for transporting timber to mills down the Trent.

From the writings of Thomas White, about Peterborough County, based on the census of 1861 we have a statement that:-

"many persons, intelligent and well informed have expressed their astonishment upon making a visit to Peterborough at its position. Much of that prosperity is due to the magnificent water power which the River Otonabee presents. It offers sites for manufacturing purposes unsurpassed by any stream in either section of the Province".

FOREST PRODUCTS -- ESTIMATED FROM CENSUS OF CANADA FIGURES
DURHAM COUNTY

Products	Species	Unit	1870	1880	1890	1900	1910	1920	1930	1940	1950
Pulpwood		Cords			27			14	1		
Tanbark		"	349	157	187	75					
Lathwood		"	82	2,000							
Masts & Spars		Number	17	45	141	153					
Staves		"	1,570M	349M		\$558					
Fence Rails		"						1,678	3,601		
Fence Posts		"			55,150	28,894	24,191	11,180	20,322		8,954
Poles		"			1,276	1,296	916	306	957		326
Railway Ties		"			400	6,721	275	9,400	170		
Shingles		"			2,300M						
Fuel Wood		Cords	83,131	82,282	51,171	43,270	29,953	26,933	24,835	21,127	6,441
Square Timber & Logs	Ash	Cu. Ft.				2,405					
	Birch & Maple	"	2,000	85	5,700	1,000	3,000				
	Butternut	"		1,080							
	Elm	"	2,840	5,612	2,442	7,515	5,790				
	Oak	"	6,150	10,650	2,225		4,200				
	Pine	"	172,288	80,616	114,992	5,780	23,210				
	Tamarack	"	620	1,872	1,192						
Lumber	Others	"	172,391	51,011	37,463	5,098	1,400				
	Pine	M bd.ft.	7,346	8,240	3,135	3,777	171)	711	774		763
	Others	M bd.ft.	948	2,715	2,199	2,257	793)				
Other Products		\$					25	2,902	2,077	5,086*	1,872

* Includes lumber, posts and poles
M = Thousand (1,000)

PETERBOROUGH COUNTY

Products	Species	Unit	1870	1880	1890	1900	1910	1920	1930	1940	1950
Pulpwood		Cords			94	1,213	407	962	1,644	894	139
Tanbark		"	140	536	451	1,236	78				
Lathwood		"	35	258	60						
Masts & Spars		Number		164	330		269				
Staves		"	593M	114M	325M	\$319	\$689				
Fence Rails		"						11,660	3,495		
Fence Posts		"			248,798	63,503	39,771	23,331	49,961		9,092
Poles		"			4,756	5,208	7,863	2,341	4,203		188
Railway Ties		"			263,856	94,432	67,050	13,334	16,977		
Piling		"					144				
Shingles		"			14,935M						
Fuel Wood		Cords	71,885	105,658	94,940	93,482	47,369	42,454	38,392	37,465	13,358
Square Timber & Logs	Ash	Cu. Ft.				7,087	1,186				
	Birch & Maple	"	907	4,300	11,326	3,160	11,060				
	Black Walnut	"									
	Butternut	"	2,832	4,436	37						
	Elm	"	40,852	15,536	9,140	14,326	55,846				
	Hickory	"		8,530	100						
	Oak	"	3,724	8,833	10,200	1,110	3,913				
	Hemlock	"									
	Pine	"	551,955	689,020	93,858	2,635	11,933				
	Spruce	"									
Lumber	Tamarack	"	17,500	39,423	3,766						
	Others	"	139,480	2,560,293	113,410	17,170	65,944				
	Pine	M bd.ft.	55,344	132,679	61,684	43,629	1,139	4,130	1,659		1,625
Other Products	Others	M bd.ft.	2,061	46,587	24,746	14,172	5,889				
		\$				8	34	549	6,739	33,638*	1,136

* Includes lumber, posts and poles

M = Thousand (1,000)

Local sawmilling was no doubt encouraged by the development of rail transportation. Two rail lines were built - one from Cobourg to Peterborough in 1854 and the other as a branch line of the Port Hope, Lindsay and Beaverton line which was completed to Peterborough from Millbrook in 1858.

In 1852 sawmills, numbering 25 and all water-powered, produced 463,560 board feet over the whole county. In 1860, 37 mills produced 1,860,027 board feet, an appreciable increase. Sawn lumber was produced principally from pine, which peculiarly enough was considered more of a scattered included species in the hardwood stands by the original surveyors.

The amount of sawn lumber exported from the county rose to 3,500,000 feet in 1865, 7,500,000 feet in 1865-66, and then rose sharply to 50,650,000 in 1866 with an expected increase of 30 per cent in the following year. In 1880 132,679,000 feet were produced in the county in pine alone.

Production began dropping as standing timber supplies diminished by the turn of the century, and continued dropping to the 1950's.

At present, pine as a constituent of any woodlot, regardless of age class, is a major component in only 1,986 acres of woodland. Over the whole Otonabee Watershed, this amounts to part of only 2.7 per cent of all the forest cover.

From 1870 on, the Census of Canada figures help us trace the changes in forest production and products. While the varying basis used for census returns at different periods makes exact comparison difficult, some general trends are clear from the accompanying tables. The peak production shown for many products is in 1870 and 1880. Soon after 1900 such products as tanbark, lathwood, masts, staves, shingles and piling drop from the list, and production of other products shows a sharp decline. The one product which has persisted through the record is fuelwood, which, for the combined counties of Durham and Peterborough, has dropped from a peak of 235,358 cords in 1890 to a low of 36,911 cords in 1950.

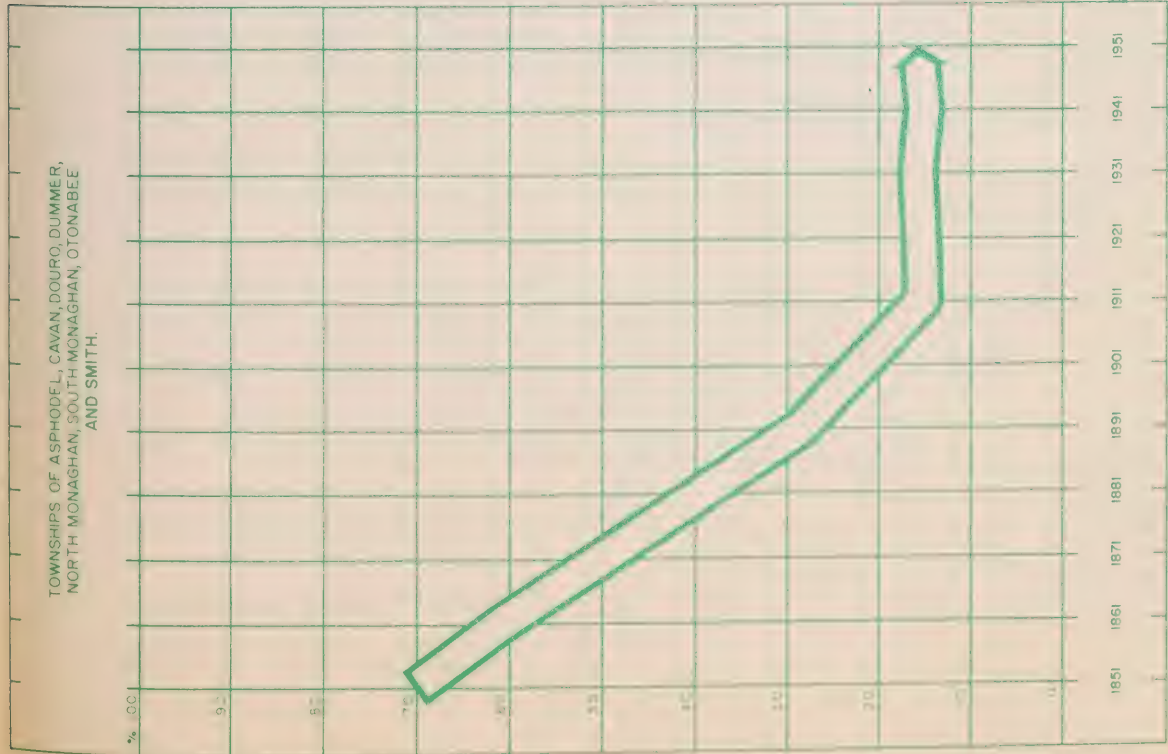
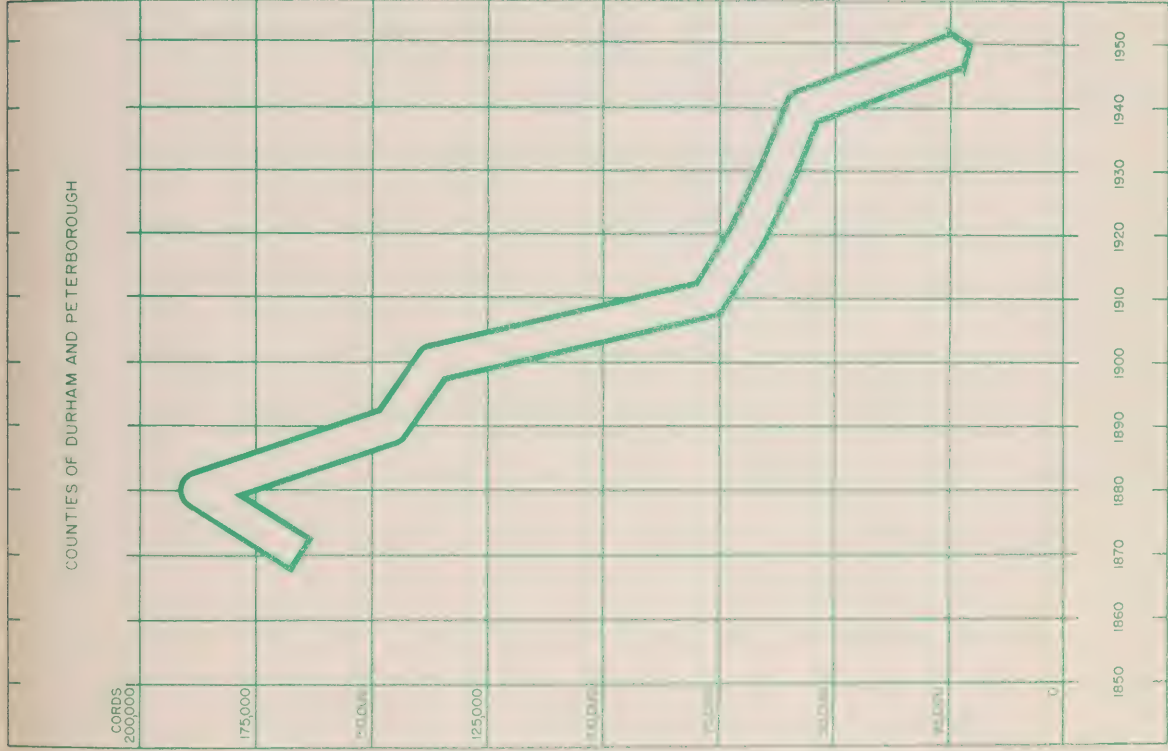
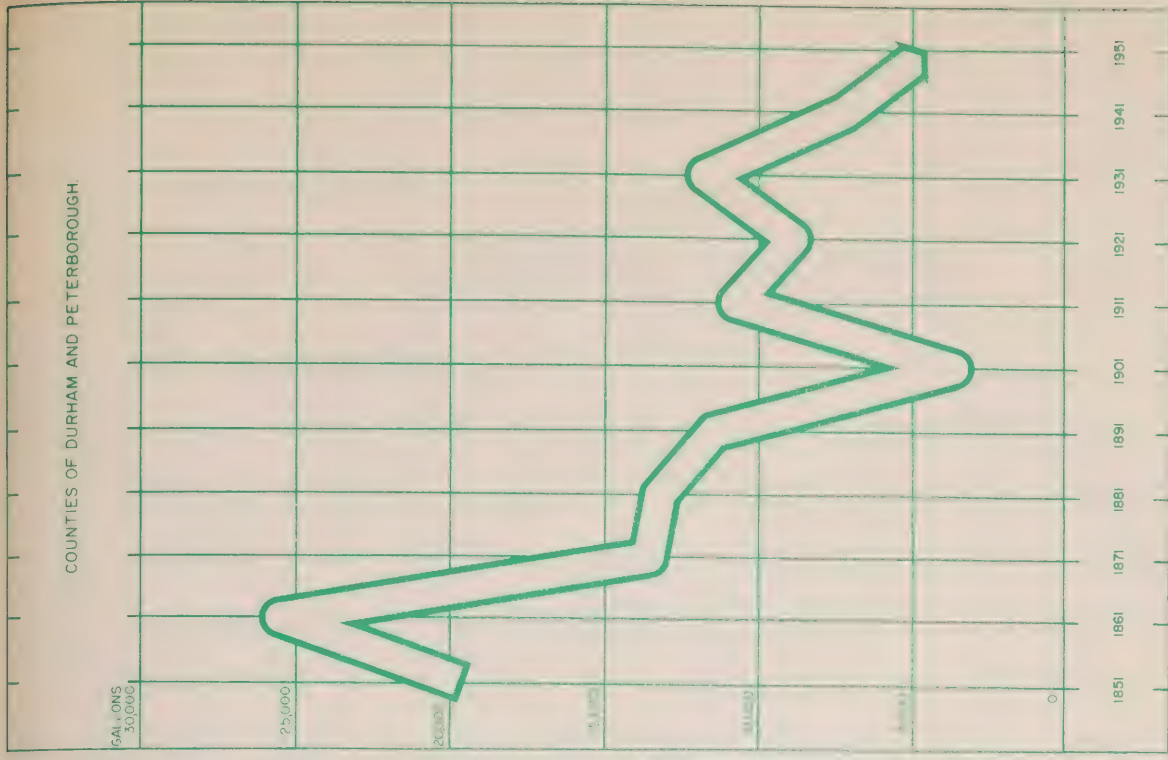
The addition in 1890 of fence posts, poles and railway ties reflects the development of the area. The introduction of wire fencing, the development of the telephone and the expansion of telegraph service all stimulated forest production at this period. The subsequent sharp decline in these products shows the rapid depletion of supplies.

Tamarack was an important timber until 1890, when the species was almost wiped out by the depredations of the larch saw-fly. The amount of walnut, butternut and hickory cut was never large, and after 1890 these species disappear from the record.

In 1920 no square timber is shown, and from this time on lumber production is small and is no longer separated by species.

Wilmot in his survey of Monaghan in 1817, came upon and noted "an old sugarbush" on Concession IV, Lot 5 on the east side. Birdsall also made note of "an old sugarbush" on Lot 18 between Concession III and IV of Smith Township near Mud Lake in 1830. These observations are interesting in that they prove that the Indians used this method of forest utilization before the survey and settlement of the country by white men. The early settlers also manufactured maple syrup products as they were almost the only form of sugar available.

(EXPRESSED AS GALLONS OF SYRUP)



CHAPTER 2

THE SURVEY OF PRESENT WOODLANDS

1. Introduction

The entire Otonabee region lies within the Huron-Ontario Section of the Great Lakes-St. Lawrence Forest Region. In this forest section, as a whole, the prevailing association of forest trees is dominated by sugar maple and beech and is described as the climax type for the area. Occurring in this climax type are other associated species such as basswood, white elm, yellow birch, white ash, hemlock and white pine. After disturbances such as cutting or fire this climax type may be replaced for a time by poplar and white birch. On local or specialized sites such as river bottoms and swamps there occur other aggregations of trees which bear no relation to the typical or climax forest of the area; for example, associations where white cedar or elm are the dominant species. On the Otonabee this latter condition actually occupies a greater area than the climax type. Such distinctive local combinations of tree species are in response to very local climatic, soil, topographic and drainage features.

2. Physiographic Features

A general knowledge of the physiographic features of the Otonabee region is useful in the study of the particular forest conservation problems of the watershed. As stated in the Land Use Report, there are four major physiographic divisions in the watershed. These are:

- (a) The Oak Ridges Moraine
- (b) The Schomberg Lake Plain
- (c) The Peterborough Drumlin Field
- (d) The Dummer Moraine

It is the past treatment or lack of treatment of sections of these above features, that has created the forest conservation problem as it appears to-day on the Otonabee Watershed.

Generally speaking the most commonly observed forest feature on the Oak Ridge Moraine would be that the greatest amount of plantation work has been done here. While this is a direct response to the rough topography and droughty soils, much of the interest shown in this section is undoubtedly due to the influence and proximity of the Ganaraska Authority and the Durham County Forests.

On both the Schomberg Lake Plain and the Peterborough Drumlin Field, the most prevalent forest feature is the occurrence of elm and poplar types, with some cedar, on moist and wet low-lying areas.

In contrast the forest areas of the Dummer moraine are characterized by shallow, droughty and bouldery soils over limestone at the edge of the Precambrian Shield.

3. Survey Methods

For the detailed forest survey of the Otonabee Region Conservation Authority, aerial photographs, each covering about 1,000 acres were provided to the forestry party. Mapping in the field was done directly on those photographs.

Each area of woodland, scrubland, swamp and rough land was visited and described as to acreage, cover type, presence of grazing, reproduction, and average diameter at breast height. Each woodlot was classified as hardwood, coniferous or mixed. The term "hardwood" is used to denote all broad-leaved trees regardless of their physical hardness. A woodlot in which 80 per cent or more of the trees are hardwoods is called a hardwood stand; one in which 80 per cent or more of the trees are conifers is called a coniferous stand, and all other stands are classed as mixedwood.

Plantations were likewise examined and records made of method of planting, approximate age, care, damage and survival.

Land suitable for reforestation was mapped and descriptions prepared in some detail for the larger areas.

4. Forest Cover Types

The term "forest cover type" refers to those combinations of tree species now occupying the ground, with no implication as to whether these types are temporary or permanent. A slightly modified form of the system drawn up by the Society of American Foresters has been used on this survey so that the system will adequately describe the cover types common to the watershed. The gaps in the numerical system are due to certain cover types found in the eastern United States which do not enter Canada.

The following cover types were encountered on the Otonabee Region Watershed:

<u>Type Number</u>	<u>Name</u>
3	Red pine
4	Aspen
4a	Poplar - oak
5	Pin cherry
6	Paper birch
8	White pine - red oak - white ash
9	White pine
10	White pine - hemlock
11	Hemlock
12	Sugar maple - beech - yellow birch
13	Sugar maple - basswood
14	Sugar maple
21	White spruce - balsam fir - paper birch
22	Balsam fir
23	Black spruce
24	White cedar
25	Tamarack
26	Black ash - white elm - red maple
47	Black locust
49	White oak - black oak - red oak
50	White oak
51	Red oak - basswood - white ash
52	Red oak
57	Beech - sugar maple
58	Beech
60	Silver maple
60a	White elm
88	Willow

Although twenty-eight (28) cover types were identified in the watershed, nearly 83 per cent of the woodland is contained in four cover types. In order of the area which they occupy these types are as follows:

Type 60a - White elm, occupies 27.5 per cent of the woodland area. With the closely related type 60 (silver maple - white elm) which occupies another 3.9 per cent of the wooded area it occurs in stream bottoms and on swampy depressions where the land is too wet for agricultural purposes unless completely underdrained. It sometimes spreads out onto slightly drier sites on adjacent pastures. Because of its occurrence on moist sites difficult to operate, there are left-over stands which in future, may attain a greater economic importance because of their size and quality. As well as occurring in headwater swamps this type is frequently found bordering main drainage channels, where it has considerable importance in slowing down spring run-off. Unfortunately this type is not regenerating well.

Type 4 - Aspen, occupies 22.6 per cent of the woodland acreage. Aspen is a pioneer type coming in after clear cut operations, over grazing or fire. It frequently is the invasion species on abandoned fields and pastures. Though it avoids the wettest swamps it does grow on soils that are wet throughout a good part of the year, and occurs as well on the droughty soils.

Its associates may be large-toothed aspen, balsam poplar, red cherry, white elm and paper birch. An understory of dogwood or of spruce and balsam fir on the wet sites, or of tolerant hardwoods on the drier sites, is frequently present.

The association of aspen with white elm and balsam poplar is particularly common on wet sites on the Otonabee Watershed. These areas may have been overcut in the past allowing the poplar to invade the stand. On the moist sites a high percentage of heart rot in the aspen suggests that it will be replaced by other species in a relatively short time.



White elm occupies most of the low wet areas of the watershed.



Aspen is a common associate of elm in the Otonabee region.

On dry and droughty sites it combines with paper birch in quantity, particularly on areas of the Dummer Moraine. Under such conditions it is useful as a nurse crop for white pine and the more valuable tolerant hardwoods.

Type 14 - Sugar maple, occupies 17.1 per cent of the woodland area. This type is connected with the better type soils particularly in Cavan and Otonabee Townships. Often it owes its prominence to cultural practices favouring maple succession. Maple also occurs in good form on the Dummer Moraine areas of the watershed. This type and the closely related Type 57 (beech - sugar maple), which occupies almost an additional 2 per cent, originally covered most of the better upland soils of the watershed, but since it occupied land which was considered fertile and with good moisture conditions much of it was cleared to make way for agriculture.

Type 24 - White cedar occupies 15.6 per cent of the woodland acreage. This type occurs most commonly on the muck soils of the swamps where it has such associates as black ash, white elm, tamarack, red maple, yellow birch, hemlock, white pine and white birch. Where lime is plentiful white cedar may extend over to droughty upland slopes where it tends to form pure stands.

This species is increasing in importance to the farmers in the watershed since each woodlot of cedar represents an immediate source of income in the form of posts. The demand for vine poles is sufficient at present to induce property owners to cut off even the smallest trees, thereby clearing any cedar woodlot completely.



In properly managed sugar maple stands, the mature trees are removed. This promotes regeneration and the growth of a fully stocked woodlot.



White cedar is an important forest type on wet soils.

FOREST COVER TYPES

Township	Area	4	4a	6	9	11	13	14	21	23	24	25	26	50	52	57	58	60	60a	88
Asphodel	168	64										18	9						77	
Cavan	14,354	4,389	163	159	255	48	158	2,747		3	2,496	271	31		266	700	14		2,166	
Dummer	8,567	1,432	72	84	461	24	144	2,437	294	10	1,726	10	14		11	81		73	1,580	
Douro	10,948	2,583	3	66	159		32	849			2,067	472	133			21		181	4,364	
N. Monaghan	2,132	1,057		17		8	11	200			168					39		293	339	
S. Monaghan	3,119	750			5	78	19	352			289	22				145	19	574	767	80
Otonabee	13,723	2,044		45	254	88	9	2,118		89	1,176	26		128	274	333	125	1,179	5,702	125
Smith	19,888	4,172	232	450	722	34	255	3,768	29	108	3,413	92	62	24	693	117	25	270	5,224	
Total	72,899	16,491	470	831	1,856	280	628	12,471	323	210	11,353	893	249	152	1,244	1,436	183	2,863	20,219	207
Percent	100	22.6	0.6	1.1	2.5	0.4	0.9	17.1	0.4	0.3	15.6	1.2	0.3	0.2	1.7	1.9	0.2	3.9	27.5	0.3

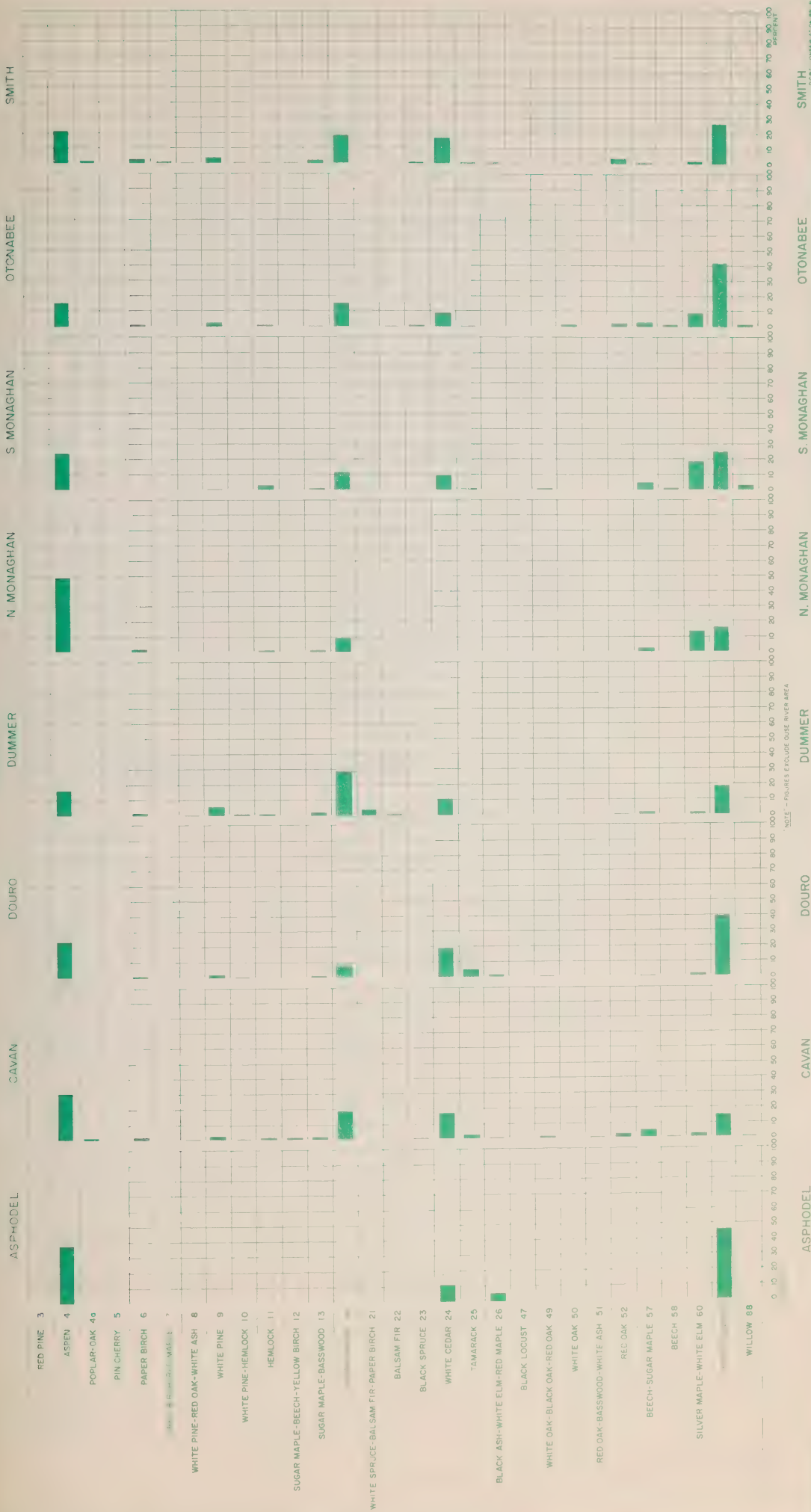
Ten other types occur as traces, each constituting less than 100 acres of woodland. These are:

Type 3 - 16 acres	Type 12 - 91 acres
" 5 - 7 "	" 22 - 65 "
" 7 - 97 "	" 47 - 2 "
" 8 - 34 "	" 49 - 81 "
" 10 - 90 "	" 51 - 57 "

FOREST COVER TYPES BY TOWNSHIP

PERCENTAGE BY TOWNSHIP

1960



MAP BY OTONABEE REGION

NOTE - FIGURES EXCLUDE OUE RIVER AREA

SMITH
JULY 1960

Type 9 - White pine constitutes 2.5 per cent of the woodland.

This type is most common on light sandy soils. It may occur also on clay, in swampy areas and on loamy sand. On sandy soils it tends to be permanent, but on heavier soils it is usually succeeded by sugar maple, beech, red oak, basswood and white ash, and is likely to be succeeded by other types containing a larger proportion of these species.

At the time of survey, only three stands of mature white pine were found with an area of 20 acres or more. One of these, at Bridgenorth, was in the process of being clear cut.

The outstanding remaining example of this type is at Young's Point. This stand has been carefully preserved by the Young family and is at present under technical study.

5. Conditions of Woodlands

Natural woodland within the Otonabee Watershed comprises 72,899 acres or about 25.1 per cent of the total area. Of the total wooded area, 70.3 per cent is classed as hardwood, 15.4 per cent as mixedwood, and 14.3 per cent as coniferous. The latter figure indicates that even the cedar has a considerable admixture of swamp hardwoods.

Practically none of the present woodland is mature and merchantable although there are merchantable trees in stands of the smaller age classes. Of the 72,899 acres of existing woodland, only 482 acres or 0.7 per cent are classed as over 18 inches diameter at breast height. Coniferous stands between 10 and 18 inches, the size desired for posts and poles, make up about 1.4 per cent. In comparison over 18 per cent of the area's hardwood is in this size class.

A high percentage (61 per cent) of the watershed's woodland is classed as between 10 and 4 inches, with another 8 per cent under 4 inches. These two classes include 74 per cent

of the hardwood, 80 per cent of the mixedwood and 89 per cent of the conifers.

From these figures it can be seen that it will take considerable time for these trees to grow to merchantable size. Where stands are overstocked this period can be shortened by thinning, but 67 per cent of the woodland is already slightly to severely understocked. This is an indication of the need for greater care including, in some cases, underplanting and interplanting to supplement the natural regeneration.

The hardwoods over 10 inches (18.7 per cent) and the mixedwood and conifers over 4 inches (27.5 per cent) will soon reach maturity and should pay for proper management in a relatively short time.

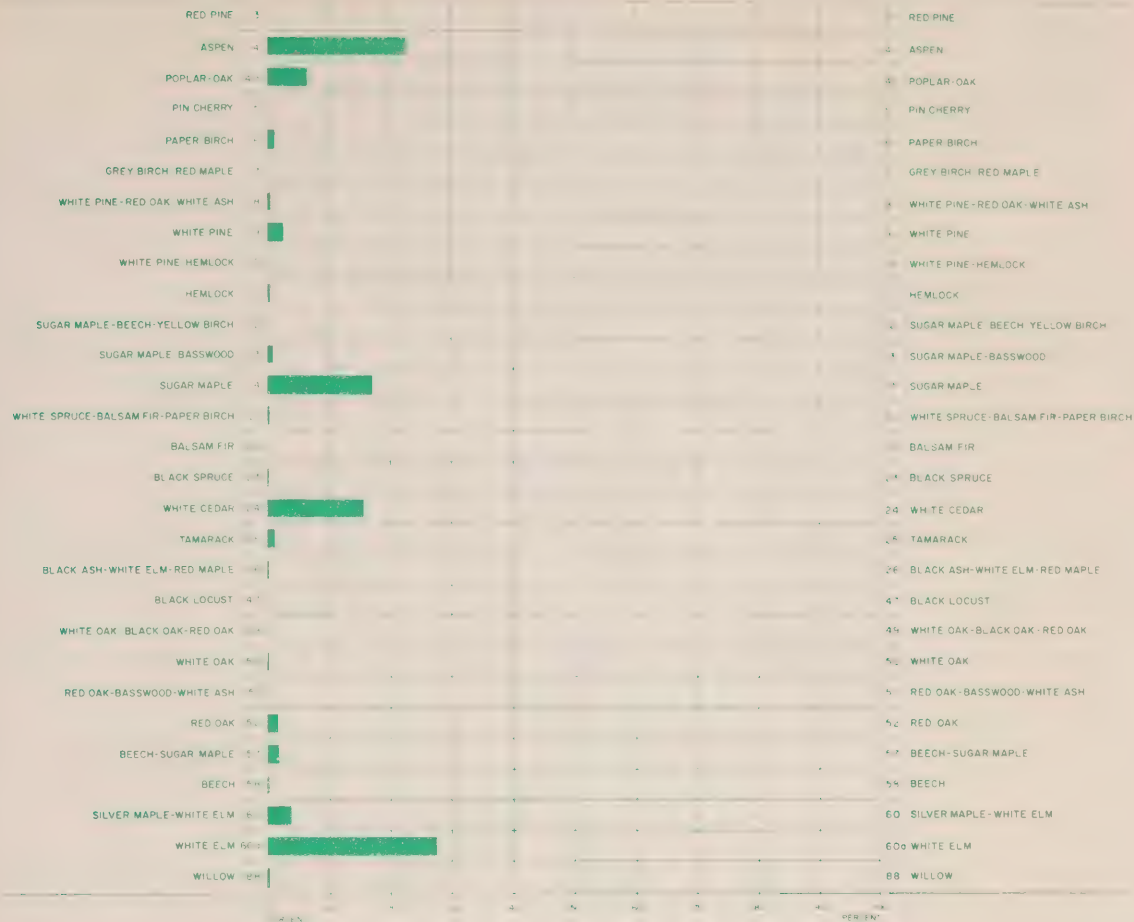
There are considerable areas of temporary species, such as poplar, forming mixtures with the more permanent cover types such as elm and elm - silver maple. These stands will require careful management in converting them more rapidly into a greater area of more valuable permanent cover types.

One of the main things needed to achieve better woodlot conditions is an improvement in natural regeneration. At present, 85 per cent of the woodland area of the Otonabee shows regeneration only fair to poor. Grazing on 40 per cent of the woodlots accounts for part of this condition.

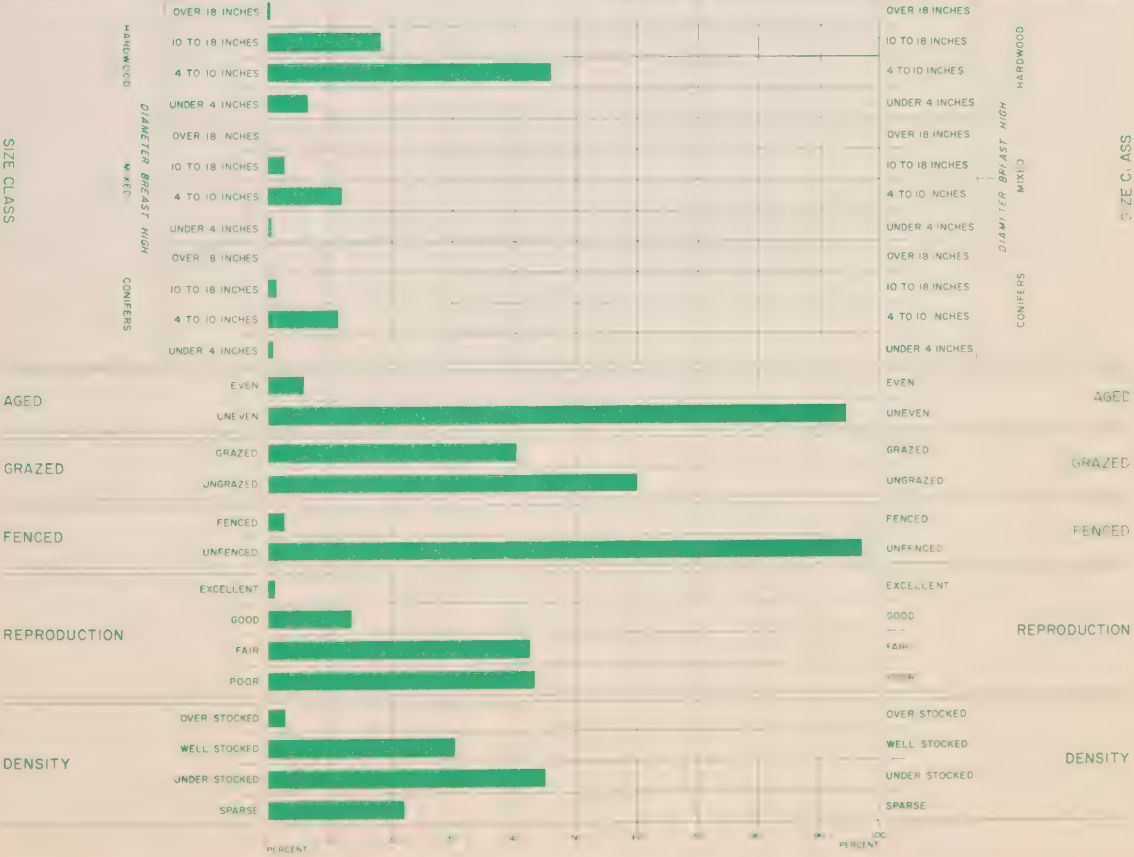
White pine, although somewhat scattered even in the original forests, is still an important species because of its high value as quality lumber. The condition of the three older pure stands and the few younger stands in the watershed is therefore of interest.

The Bridgenorth stand, which in 1818 was a red oak forest, undoubtedly changed to pure white pine after the first cutting. Since its removal, without benefit of selective cutting methods, it will likely gradually change to a white pine - hemlock stand, useful in time, but with the aesthetic value of the large pines lost to the resort town of Bridgenorth as a scenic feature.

FOREST COVER TYPES TOTAL WATERSHED
OTONABEE REGION (EXCLUDING OUSE RIVER AREA)



WOODLAND CONDITIONS TOTAL WATERSHED
OTONABEE REGION (EXCLUDING OUSE RIVER AREA)



The Young's Point stand is well stocked. Regeneration in this stand is principally maple and choke cherry, with only a very few pine seedlings appearing near the edges.

The white pine stand just south of Dummer Lake has a more irregular stocking. The quality of timber is also reduced because the trees are branchy.

Of the remaining white pine stands, both large and small, 56 per cent are reasonably pure conifer and 44 per cent are mixedwoods with white pine dominant. Over half the white pine area is in the 10- to 18-inch d.b.h. class, with 37 per cent in the 4- to 10-inch class and 1 per cent under 4 inches.

Only 15 per cent of the existing white pine is fully stocked and only 6 per cent is regenerating well.

6. Scrublands

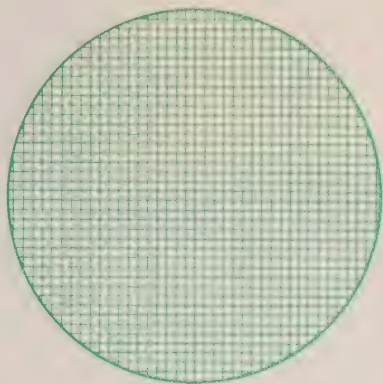
In all, 9,352 acres of the watershed are covered with tree species which never attain commercial size. The most common species are scrub willow and dogwood on poorly drained sites, and hawthorn and sumach on dry sites. Much of this area is located on abandoned farmland or neglected pasture.

In some cases this land can be restored to agricultural use through drainage or through eradication of dry scrub. However, where such restoration does not seem economically feasible the area should be returned to tree cover through systematic replacement of the scrub species with more valuable species.

The distribution of these scrublands is shown in the following table.

Township	Dry Scrub (acres)	Wet Scrub (acres)	Total Scrub- land (acres)
Asphodel	0	2	2
Cavan	755	1,985	2,740
Dummer	172	118	290
Douro	109	986	1,095
N. Monaghan	101	815	916
S. Monaghan	54	468	522
Otonabee	155	1,821	1,976
Smith	561	1,250	1,811
Total	1,907	7,445	9,352

OTONABEE REGION

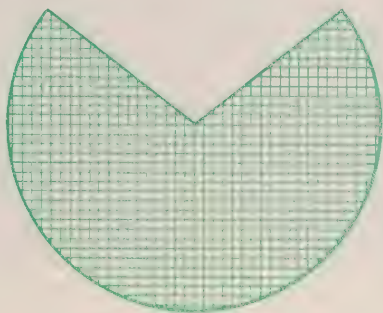


TOTAL AREA OF REGION

(EXCLUDING OUSE)

290,368 Acres

100 %

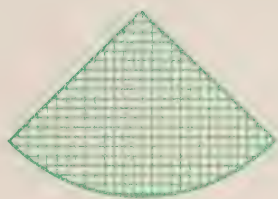


OPEN LAND

(INCLUDING WATER & MARSH)

206,948 Acres

71.3 %



WOODLAND AND PLANTATION

74,068 Acres

25.5 %



SCRUBLAND

9,352 Acres

3.2 %



A typical scrub area. Though there are some forest trees growing on this site it should be improved by planting between these trees.



White spruce, red pine, white ash reforestation - an excellent example of a planted mixed wood.

CHAPTER 3

FOREST CONSERVATION MEASURES IN PROGRESS

1. Private Planting

On the Otonabee Watershed there are 1,169 acres of private plantations, ranging from 1 to 30 years in age. These are mostly made up of coniferous species. There are some private experimental areas of coniferous-hardwood mixtures and a very limited acreage of pure hardwood planting.

Within the past 10 years the acreage planted has been five times as much as that of the previous twenty-year period. This increase has been distinctly localized. For example, in Cavan Township, the acreage planted to trees is now eight times what it was ten years ago. On the rest of the watershed, new planting has amounted to only about half the area planted before 1950.

It is significant that 60 per cent of the reforestation in Cavan is either pure Scotch pine or Scotch pine in mixture. Only 9 per cent of these trees are too old for Christmas trees, indicating that most of the Scotch pine planting is for this purpose. Mixtures favoured are usually Scotch and red pine combinations. Red pine and white pine occupy 5 per cent and 3 per cent respectively of the plantation area of Cavan.

The exceptions to this trend in Cavan occur mainly on two properties. On Concession II, Lot 6, the owner has used eleven different species combinations, including white pine, red pine, Carolina poplar, white cedar, white spruce, red oak, European larch, Scotch pine and black locust. These have been planted with regard to the proper site conditions and in some cases have received experimental chemical fertilizer applications.

On the property of T.H. Shields, (Lot 10, Concession XIV) hardwoods have been used in mixture with conifers to form good examples of mixed forest artificially established. Mr. Shields has used red and white pine, Scotch pine, European larch, white spruce, white ash, silver maple, white birch, black locust and basswood. The basswood were taken out of natural woodlots as seedlings and transplanted, and have survived well.



A well managed Scotch pine Christmas tree plantation near Glamorgan.



Abandoned Christmas tree plantations are unlikely to produce worthwhile timber.



This red pine reforestation is producing sound straight stems and will become a good timber stand.

Over the rest of the watershed, private reforestation has been rather desultory. Scotch pine as Christmas trees or otherwise, have not been particularly favoured. Plantings of Scotch and red pine in pure and mixed stands occupy almost equal acreages. White pine as a pure stand occupies only 11 per cent of the small total reforested acreage, with the remainder mostly divided between small plantations of white spruce, Jack pine and some Jack pine - white pine in combination.

In most cases the care of the plantation is non-existent. The few exceptions include two small pine plots near Young's Point which have been properly pruned, and a few plantations on which fire guards have been maintained.

2. Demonstration Woodlots

An early effort to promote good woodlot management was made by the Department of Lands and Forests when it established a number of demonstration woodlots. These were areas of private woodland on which owners agreed to follow prescribed methods of woodlot management and to permit access to the area by interested persons. Unfortunately, some of these demonstration woodlots were cut over when the property changed hands, and others were neglected so that they no longer serve their original purpose.

A few owners are still proud of their demonstration woodlot signs and continue to give good care to their woodlots.

3. Demonstration Forests

The most important measure which could be taken for forest conservation would be the improved management of present woodlots. Undoubtedly the best example of this practice on the Otonabee is the Mark S. Burnham Provincial Park. This is an area of 103 acres granted by the Crown to the Honourable Faccheus Burnham in 1830. It was given back to the Crown by Mrs. Mary S. Burnham, widow of his grandson, Mark S. Burnham. It was officially dedicated on May 11, 1957.



Pruned plantations mean good quality timber in the future.

The area is managed by the Department of Lands and Forests on a silvicultural basis. The department is at present removing 60 cords a year as firewood. The park is located on Highway No. 7, a few miles east of Peterborough.

4. Tree-Cutting By-laws

Under The Trees Conservation Act of 1946 and its successor The Trees Act (R.S.O.) 1960, C.406, 23 counties have passed by-laws to restrict and regulate the cutting of trees. These by-laws do not interfere with the right of the owner to cut material for his own domestic use, but specify certain diameters below which trees may not be cut for sale. The Durham County by-law forbids the cutting for sale of most species under 10 inches diameter at breast height and a few species such as cedar under five inches. Unfortunately, this county had one by-law for the Ganaraska Authority area and another for the rest of the county "except the area of any watershed for which an Authority is, or may be established". The Otonabee Region is therefore removed from these provisions for the County of Durham, and since the remainder of the Authority is in Peterborough County which has no tree-cutting by-law, the Authority area is without any protection of this kind.

Such diameter limits are only an elementary step to prevent indiscriminate slashing of woodlands, but where these by-laws have been enforced rigidly they have proved of considerable benefit. There will, however, usually be fast-growing trees above the diameter limit which are increasing rapidly in value, and should be left for future cutting. There will also be poorly formed or diseased trees below the diameter limit which should be removed.

Better than a rigid diameter limit is the marking of trees for cutting according to their condition. Professional advice on such marking is available through the Zone Forester at Lindsay, Ontario. Many tree-cutting by-laws, including that of

Durham County, provide for the necessary variations from a strict diameter limit where the cutting is done under such supervision and in accordance with good forestry practice.

It is recommended that the Authority promote the adoption of a tree-cutting by-law for Peterborough County and the revision of the Durham County by-laws to give uniform protection throughout the county.

5. Forest Conservation Measures in Other Areas

(a) Authority Forests

Agreements for establishment and management of Authority Forests, which are described in detail in the next chapter, have been drawn up between 14 Conservation Authorities and the Ontario Government. Under these agreements over 50,000 acres had been acquired for reforestation and management up to December 31, 1960.

(b) County Forests

Many counties have established forests under agreement with the Ontario Government. Enabling legislation for the establishment of county forests was passed as early as 1911, but it was not put into effect until the establishment of the Hendrie Forest in Simcoe County in 1922.

The work is done at present under The Trees Act of 1950 and The Forestry Act of 1952. These Acts provide for the purchase of lands and for their management under agreement between the County and the Ontario Government.

Durham County has been active more recently, but the county forest just borders the south-western corner of the Otonabee Watershed. A county forest was established in Peterborough County in 1928. It is also out of the watershed and was never placed under agreement with the Ontario Government.

(c) Municipal Forests

Several municipalities other than counties have established forests, which are eligible for assistance from the Department of Lands and Forests. These are useful for screening residents from factory areas, for water supply protection and for

revenue production. The 100-acre plantation at the village of Beeton's reservoir is a good example of municipal forest, and has been producing revenue for the village since 1952.

(d) Tree Farms

In the past few years a movement has been under way to recognize well-managed forest properties as Certified Tree Farms. With the sponsorship of several organizations interested in better forestry, the Canadian Forestry Association in 1953 formed a National Tree Farm Committee to recognize with a suitable sign and certificate those owners who agree to maintain their land for growing forest crops, protect land adequately, agree that cutting practices will be satisfactory to ensure future forest crops, and permit inspection by Committee foresters.

There are a number of such farms on the Otonabee Watershed, all in Cavan Township, that are under consideration for certification. Most of these have a program of removal of mature trees for sawlogs and defective trees for fuelwood, and the production of maple syrup. These show what can be done by forward-looking members of the community.

Several Conservation Authorities have become co-sponsors of the Tree Farm movement in their areas. It is recommended that the Otonabee Region Authority give similar support to this movement.

(e) 4-H Clubs

These clubs are organized by the Ontario Department of Agriculture assisted by the Department of Lands and Forests and must be sponsored by an organization interested in the improvement of woodland and reforestation.

Members must be between 12 and 21 years of age and each member undertakes a project such as marking a half-acre plot of woodland for thinning or reforesting a quarter-acre of land. Projects are judged annually on Achievement Day and prizes awarded. For this purpose the Department of Agriculture furnishes \$3.00 per member and the sponsoring organization \$1.50. Winners may enter the provincial Inter-Forestry Club Competition.

One such 4-H club worked out of Lakeland on the Otonabee Watershed, but is no longer in operation. The Authority should consider sponsoring a revival of this work.

CHAPTER 4

FOREST CONSERVATION MEASURES REQUIRED

Two basic problems are apparent from the observations made during the survey of the Otonabee region. First, there has been little long-term consideration given to woodlots and forestry on the watershed, with the result that there is not enough good-sized quality timber to be had for harvesting. There are scattered areas of reasonable timber and fortunately a pattern of moist site natural woodlots is left which still aids in the control of run-off. The preservation and improvement of these swamps is vital to the watershed, and the use of tree cover for this purpose will mean profitable timber in the future.

Secondly, there has been considerable abandonment of land with little effort made to return it to its original cover. Indeed, many of the watershed's steep slope sections should never have been cleared for agriculture. In addition there is still much unnecessary clear cutting, particularly in immature stands, leaving a heavy and unmanageable layer of slash. The semi-portable and portable sawmill and the chain saw, have been used to speed this process, and there seems to be no reason to expect improvement in private woodlot management in the immediate future.

1. Authority Forest

In view of the conditions described, it is obvious that an Authority Forest on the large areas in forest or in need of reforestation, should be a prime objective of the Authority.

Fourteen Conservation Authorities have now entered into agreements with the Ontario Government for the establishment and management of Authority Forests. The Province advances half the cost of the land and, in some cases, where it is necessary or desirable to include merchantable timber, the Province also assumes the cost of the merchantable timber. These contracts run for an agreed period, during which time the



Land on the side of a drumlin that should be reforested.

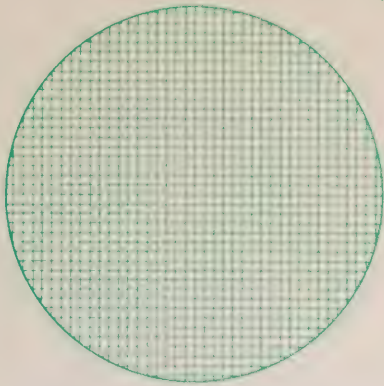


This type of clear cutting should be discouraged and slash should be lopped and scattered.

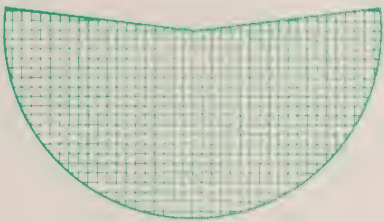
RECOMMENDED AUTHORITY FOREST - ACRES

Township	Wooded	Cleared	Scrub	Marsh or Water	Total
Cavan	6,729	4,805	310		11,844
N.Monaghan	801	645	194		1,640
S.Monaghan	1,520	1,050	101		2,671
Otonabee	2,396	3,634	182	135	6,347
Douro	6,467	5,423	337	88	12,315
Smith	10,313	7,325	291		17,929
Dummer	6,012	4,134	146	5	10,297
Total	34,138	27,116	1,561	228	63,043
Percentage	54.1	43.0	2.4	0.5	100

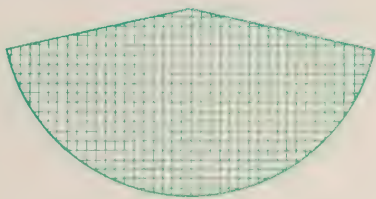
OTONABEE REGION (EXCLUDING OUSE)



TOTAL AREA
OF
RECOMMENDED AUTHORITY FOREST
63,043 Acres
100%



WOODLAND
34,138 Acres
54 %



OPEN LAND
27,116 Acres
43 0%



SCRUBLAND
1,561 Acres
2 4%



MARSH AND WATER
228 Acres
0 5%

Ontario Government agrees to establish the forest and pay the cost of such items as fencing, buildings, equipment, labour, maintenance, trees - in short, everything connected with the management of the forest.

At the end of the agreement period the Authority may exercise any one of three options; first, to take the forest over from the Government and pay back the cost of establishment and maintenance without interest; second, to relinquish all claim to the forest, whereupon the Government will pay to the Authority the original purchase price; third, the agreement may be renewed for an additional period during which the Authority and the Province will share equally in costs and profits.

In relation to the general physiographic features of the watershed, the areas recommended for Authority Forest are distributed as follows:

(a) The Oak Ridges Moraine Area

The areas recommended for Authority Forest in this section are mainly steep-sloped sand and gravel hills from which many springs arise giving permanent flow to the streams of the watershed.

The forest remaining on this area consists principally of maple and maple - beech cover types with a mixture of pine and oak, plus moist mixedwoods of cedar, poplar and elm where the natural forest extends into lowland areas.

The cleared areas, requiring reforestation, are mostly old, badly managed pastures that are still suitable for growing pine.

(b) The Schomberg Lake Plain

This is the mainly low-lying section formerly occupied by Glacial Lake Jackson and Glacial Lake Peterborough. The Lake Jackson area, now the Cavan Bog, is covered with a young forest, generally mixedwood. This stand should be preserved to protect a valuable source area. Improved cutting methods favouring the more valuable species should be employed on the bog.

The other glacial lake area presents a drainage problem and hence favours the moist site cover types as well. Though not at the headwaters of major streams, the same principle should apply as on the Cavan Bog. There are also well drained but very sandy rolling areas of the lake plain which need reforestation.

(c) The Peterborough Drumlin Field

This feature occupies the largest land area in the watershed. Because these whaleback hills with swampy valleys between cut diagonally across property lines, they present a distinctive forest conservation problem to the Authority. The better land on the hilltops and lower slopes is intermingled with the steep upper slopes and swampy valleys. Through much of this area, Authority Forest blocks are small and scattered, but in a few places other features interfere with proper agriculture and make larger forest blocks possible.

One of these blocks is associated with the narrow gravelly hill, or esker, which accompanies the valley known as the Warsaw Outlet, just south of the county road between Peterborough and Warsaw.

The same principle applies to the esker and swamp areas cutting diagonally across the upper end of Otonabee Township, Highway No. 7, and into the south-east corner of Douro Township.

Another such series of forest blocks occurs where the drumlin field meets the esker between Bridgenorth and Young's Point.

The last area in this section follows the Indian River in Otonabee Township.

(d) The Dummer Moraine

This section covers the most northerly part of the watershed. It has a poorly defined southern boundary so that there is a certain amount of overlap with the drumlin field. The bulk of the Authority Forest is placed here because of the



An area east of Bridgenorth that is too sandy to produce crops or pasture. It will grow good timber if reforested.



An area of sub-marginal land on the Dummer moraine where wood production through reforestation is better land use than pasturing. Note the cattle browse line on the woodlot in the background.



The soil in this area is too thin to convert to permanent pasture. It will grow trees successfully and should therefore be reforested.

BY PHYSIOGRAPHIC FEATURES

Township	The Oak Ridge Moraine		The Schomberg Lake Plain		The Peterborough Drumlins Field		The Dummer Moraine	
	Wooded/Cleared/Scrub	Marsh or Water	Wooded/Cleared/Scrub	Marsh or Water	Wooded/Cleared/Scrub	Marsh or Water	Wooded/Cleared/Scrub	Marsh or Water
Cavan	3,394	3,785	147					
N. Monaghan				3,335	1,020	163		
S. Monaghan				801	645	194		
Otonabee				1,520	1,050	101		
Douro				313	194	34	2,083	3,440
Smith							2,429	3,440
Dummer							1,369	2,114
Sub-total	3,394	3,785	147	5,969	2,909	492	5,881	9,024
Total	7,326 acres		9,505 acres		15,352 acres		30,860 acres	
Grand Total	63,043 acres							

droughty, bouldery, thin soils, sometimes underlain with limestone and creating conditions unfavourable for agriculture. In spite of these conditions the area will support worth-while forest cover and presents the greatest opportunity for large-scale reforestation. Since a great part of the Dummer Moraine area lies in the Kawartha Lakes tourist district, enhancement of the forest cover on it will provide an important secondary benefit.

In all, 63,043 acres are recommended for Authority Forest. Of this total 34,138 acres are already wooded in some form, 27,116 acres are cleared, 1,561 acres are scrubland and 228 acres are wetlands. Because property lines do not correspond in direction with the natural features of the area, it is inevitable that small amounts of the better land classes will be included, particularly in the drumlin field. This has been kept to a minimum.

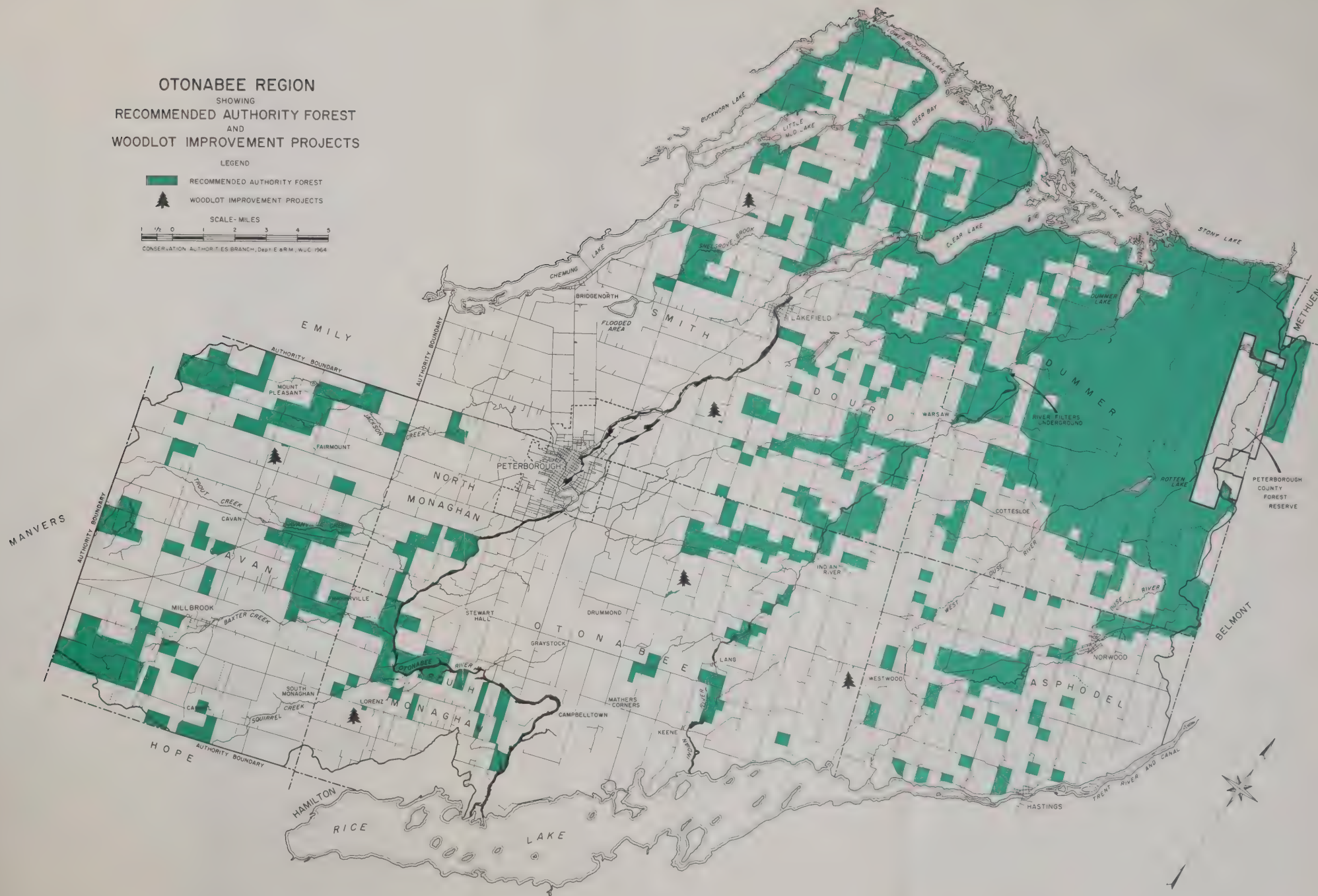
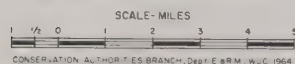
There are also a few cases where forest properties are already being properly managed by private owners. These properties need not be acquired at the present time but the Authority should be alert to acquire such lands if changing circumstances threaten the destruction of these woodlands.

The problem of land acquisition should be approached carefully. In most cases purchase will be arranged by direct negotiation. The Authority should also be alert to acquire tax-delinquent lands. The Authority has the power to expropriate land and is justified in doing so when an unreasonable attitude on the part of the owner stands in the way of works urgently required for the general good. However, a favourable public attitude is essential to the furtherance of conservation, and such powers must be used with discretion. In an exceptional case, if a hardship would be entailed by asking an old resident to move, some special provision such as a life tenancy of the house might be arranged.

OTONABEE REGION SHOWING RECOMMENDED AUTHORITY FOREST AND WOODLOT IMPROVEMENT PROJECTS

LEGEND

- RECOMMENDED AUTHORITY FOREST
- WOODLOT IMPROVEMENT PROJECTS



2. Private Reforestation

On many farms, even in the better farming areas, there are small tracts which, because of steep slopes, stoniness or poor drainage, would be better in tree cover. These tracts are not suitable for public acquisition and management, but the effect of reforestation on control of run-off, improved summer streamflow and stabilization of wood-using industry justifies public assistance in such work. These areas have not been privately reforested heretofore because the owner has some other minor use for the area, because he is discouraged by the long period between planting and harvest of a forest crop or more commonly simply because of inertia on his part.

The interest of private owners in reforestation may be fostered in several ways. Public education, such as that now carried out by the Zone Forester in the district, can be furthered by the Authority. In addition, direct assistance to private planting can be given.

Several other Conservation Authorities have purchased tree-planters which supply a planting service to private owners at a nominal cost. Where rough ground makes hand planting necessary, some Authorities refund \$10 per acre if inspection shows that planting has been done carefully and the plantation is adequately protected from livestock. When labour conditions permit, the Authority might itself organize crews for hand planting on these sites.

It is the policy of the Department of Lands and Forests to charge \$14 per thousand for Scotch pine and \$10 per thousand for other planting stock. For some years trees were distributed free. Following the end of the war in 1945, the nurseries were unable to meet the greatly increased demand, and it was felt that a charge for trees would ensure more care in ordering the required amount and in planting the trees received.

The assistance schemes carried out by other Authorities have stimulated interest in private reforestation while still ensuring the good use of the planting stock. It

is recommended that the Otonabee Region Conservation Authority adopt a similar policy of assistance to private reforestation.

Because property lines run at an angle to the topography there are many small areas requiring reforestation which are unsuited to acquisition for public forests. These smaller individual areas have been recorded on the survey photographs. Such information should be useful to the Authority in indicating to individual property owners where revisions in their land use program should be made.

3. Woodlot Improvement Projects

For most persons the best lesson in conservation is field observation of specific examples of the present abuses and efforts to remedy them. Woodlots chosen as illustrations must be near good roads and should be marked with large signs giving considerable detail of conditions and improvement measures in progress. Roadside or other parking facilities would have to be provided so that visitors could take the full time necessary for inspection without interfering with other traffic.

Some of the proposed improvements are experimental in nature. From the owner's point of view the whole program may seem to be of unproved value. On these sample areas the Conservation Authority is therefore fully justified in assuming part of the actual woodlot improvement cost as well as the cost of signs and parking facilities.

To use a private woodlot in this way for educational purposes would require a definite agreement with the owner to ensure that the proposed improvements were carried out, and that the benefits of this work would not be lost by a change of ownership or of attitude on the owner's part. In addition a detailed record of costs and returns would be necessary to show other owners that it would pay for them to adopt similar practices in their own woodlots.

Some owners may be willing to see their woodlots used for such demonstrations, but wish to be relieved of any personal participation in the project. In such cases the Authority might lease the woodlot or purchase it outright.

Below are listed several examples of well-located woodlots suitable for Authority woodlot improvement projects. The Conservation Authority should decide on suitable forms of agreement, leases, etc., explain the purpose of these projects to the owners and try to enlist them as co-operators. This list is by no means exhaustive, but serves to illustrate the type of woodlot suitable for such projects.

- (a) N $\frac{1}{2}$ Lot 13 and 14, Concession XI,
Cavan Township, 2 miles south of Mt. Pleasant

This sugar maple - basswood stand has a scattered content of beech and ironwood (hornbeam). The trees in the overstory average about 8 inches in diameter with many trees having a fairly good form. It is regenerating mostly to maple and basswood with a scattering of cherry and hornbeam.

The stand is ungrazed, but as a demonstration would be better fenced from livestock. It should also be thinned, with the removal of beech in favour of other more valuable species.

By improving only part of the woodlot, there will be a good contrast between good and bad management methods.

- (b) N $\frac{1}{2}$ Lot 5, Concession II, South Monaghan Township
1 $\frac{1}{2}$ miles east of South Monaghan Village

This is a hemlock woodlot containing scattered sugar maple and white birch. The hemlock is poor in quality and averages about 14 inches d.b.h.* The stand is heavily grazed and run-down regenerating mostly to maple.

The hemlock should be removed and the woodlot fenced to allow the stand to change to a principally maple cover type. White birch should be removed gradually in order to provide space for more valuable species.

* Diameter breast height - 4 $\frac{1}{2}$ feet above ground.

- (c) S $\frac{1}{2}$ Lot 23, Concession XI
Smith Township, 1 mile south-west of Selwyn

This is a very young predominantly elm - silver maple stand with a scattered inclusion of poplar, tamarack, white cedar, black ash and basswood.

If fenced from livestock and divided into two sections for comparison purposes it provides an excellent opportunity to demonstrate thinning methods. One section could be used to favour elm, silver maple and basswood entirely, and the other could be used to compare the results obtained by maintaining a mixed conifer and hardwood stand.

- (d) E $\frac{1}{2}$ Lot 6, Concession IX, Douro Township,
2 miles east of Nassau Mills

This is a young hardwood stand with well distributed age classes predominantly maple in content. There is a scattering of almost mature elm and white ash present and there is also a high percentage of hornbeam.

As a demonstration, removal of the hornbeam and selected elm and ash trees would show the value of a selective cutting program.

- (e) W $\frac{1}{2}$ Lot 23, Concession VIII, Otonabee Township
3 miles west of Lang.

This is primarily an open elm stand containing a large percentage of sugar maple, basswood, white birch, cedar, and white ash. It is not grazed, but is not regenerating well, and should therefore be fenced as insurance against livestock.

Because of its open nature interplanting would help the stocking.

- (f) E $\frac{1}{2}$ Lot 21, Concession I, Otonabee Township
5 miles east of Lang

This is a cut-over maple stand which is coppicing to both maple and basswood. Present also is a pole stage developed from seedlings, and heavy poplar content.

A coppice thinning to a regular spacing of single stems could be demonstrated in this woodlot.

4. Forest Research

Detailed scientific research is the task of universities or government departments with greater research facilities than are available to a Conservation Authority. Large-scale application of proven methods is the task of private owners or of the Department of Lands and Forests in managing Authority Forests. Between these two extremes, however, there are many possibilities for small-scale investigations which are urgently needed and which the Authority might encourage on its own land or on private land under agreement. Determination of the best planting methods on difficult sites such as valley slopes, comparison of growth in different plantation mixtures, investigation of the value and cost of cultivation in plantations and the actual improvement in woodlots following thinnings or other treatment are all projects which would guide the people of the watershed in managing their own plantations and woodlots. The Authority should encourage such investigations and co-operate with the Department of Lands and Forests in carrying them out.

5. The Authority and Conservation Education

Many agencies at present do, or can, engage in conservation education. The Authority can supply opportunities and materials to encourage and enlarge these activities. Wall maps, literature, conservation pictures and conservation lectures supplied to the schools will help to give geography, history and conservation practices a local significance. Building up a library of slides on local conservation problems and accomplishments would be of great assistance to speakers. Organization of public meetings and contact with individuals and groups such as farm forums will gain support for both private and public conservation efforts. Landowners should be encouraged to make greater use of the services available from the Conservation Authority and from officers of the Department of Lands and Forests and the Department of Agriculture.

The most effective educational activity is actual participation in or field observation of conservation projects. Tree planting days, group visits to woodlot improvement projects and conducted tours over a well organized conservation trail could all be sponsored by the Conservation Authority. These activities would all stimulate individual action of forest conservation measures, such as those described in the following chapter, which cannot be carried out directly by the Authority.

CHAPTER 5

FURTHER CONSERVATION MEASURES REQUIRED

1. Woodland Management

The woodlot inventory shows that there are 72,359 acres of natural woodland in the Otonabee region. Practically all of this area requires better management. While experimentation is desirable to determine the best method of handling certain problems, the general principles of woodlot management have been known for years but have not been applied. A free advisory service is available from the Zone Foresters, but is not sufficiently used, and a readily-understood pamphlet on "The Farm Woodlot" can be obtained from the Department of Lands and Forests.

One of the most difficult problems confronting the private owner in the management of his woodland is the utilization of the small woodland products which can be readily made and handled by the owner. These products, such as fuelwood, pulpwood, bolts, posts and poles, if properly harvested, increase the productivity of the woodlot and the gross returns per acre. The volume of these small products thrown on the market would be reduced by diameter-limit regulations which restrict the wholesale commercial slashing of woodlots. Nevertheless, much material of this type could still be produced from thinnings and improvement cuttings and from limbs and tops of trees. The difficulty of marketing such low-grade material has seriously hampered owners in carrying out the needed improvement work in their woodlots. Any means which can be discovered for using small and poor-grade wood should be developed to the fullest extent. At the present time interest is increasing in the possibility of manufacturing wood chips in the woodlot by means of a portable chipper. Such chips can be used for the manufacture of pulp for paper, and as cattle bedding and chicken litter, which can subsequently be spread on fields to increase the humus content of the soil. They can be made from any species



A wastefully managed woodlot. Attempted slash burning has only served to expose the hillside to erosion.



This is the result of overcutting. The remaining trees on a shallow soil blow over.

of wood, and tops and branches can be utilized. The number of pulp companies which can use hardwoods is limited at the present time and only those making kraft paper can use chips containing bark, but the demand for hardwood chips will increase and portable barkers are being developed. Every woodlot owner should consider the possibility of improving the quality of his woodlot by utilizing the low-grade material as chips or otherwise.

Owners of large woodlots might be encouraged to undertake thinnings and improvement cuttings if equipment or trained crews were available at reasonable cost. The Authority should consider offering such a service. As an alternative, the Authority might offer a subsidy for each acre improved to its specifications and found satisfactory on inspection by the Authority's officers.

2. The Forest and Livestock

The grazing of woodlots is still one of the greatest causes of woodland depredation on the farm today. This method of livestock husbandry produces automatic and continuous loss of regeneration and eventually can leave the mineral soil of the woodlot itself completely exposed. Generally speaking, 40.1 per cent of the woodlands on the Otonabee Watershed are grazed, with the highest percentage of this practice occurring in South Monaghan, Smith and Cavan Townships.

The lack of repaired fences or loss of proper pasture due to weather conditions is the usual reason given for using woodlots as pasture. However, it is not uncommon to find woodlots deliberately used as an integral part of a pasture rotation system, with cattle fenced into parts of them.

The economic fallacy of grazing the farm woodlot has been proven in Wisconsin where over a five-year observation period in Richland County it was shown that unimproved pasture will produce over five times as much (dry matter) feed as woodland and improved grass-legume pasture will produce over 11 times as much feed. Woodland pasturage is considered to be only half



Many cedar stands have been cut too early, thereby producing only small posts. These stands should have been left to grow into larger stock and to protect valuable source water areas.



A typical young hardwood stand on the watershed. Note the thick, knee high regeneration beyond the fence. Cattle should not be allowed to graze woodlots.

as good in animal nutrition as proper pasture by agricultural leaders. This is because of the lowered food value of grasses grown in shade, plus the added smothering factor of weeds which are usually prolific in wooded pastures. Even in the open park-like stands in the Rocky Mountain regions, grazing experiments have proved that acceptable gains are made by livestock in wooded areas from spring to early summer only. After this period livestock tend to lose nearly all of this weight gain, if left on the wooded range.

Field observations in Ontario indicate further that cattle prefer the more economically desirable species such as maple, basswood and elm, whereas the undesirable species such as ironwood, dogwood and hawthorn are grazed only as a last resort. This preference not only changes the quantity but the quality of the reproduction and so the succeeding stand.

All reproduction is affected to some degree by the effect of grazing on forest soil. Compaction by livestock, particularly on clay soils, makes seedling survival and growth difficult. It also breaks up the protective litter-layer, exposing the mineral soil to drying, thereby reducing germination. Consumption of the vegetation within reach reduces the volume of new litter available to keep the soil open and porous and in a highly absorptive state. Thus water relations are changed, adversely affecting the rate of tree growth and natural regeneration.

Cattle break down young trees to graze on them or to brush off the flies. This has a particularly damaging effect in young pine plantations. Sheep interfere with pine seedling growth by nipping the buds. Hogs can ruin either natural or planted woodland by grazing and scuffing the roots. This allows fungal infection as well.

There are of course, secondary benefits to the livestock from access to wooded areas. Those include shade, shelter from severe weather, protection from "face flies",

"shipping fever" causes, and quiet seclusion for the delivery of their young. The better condition of stock enjoying these facilities is a real economic gain to the farmer.

However, this gain can be secured by fencing off a small corner of the woodlot or by developing groves or shelter-belts of fast growing trees. The remaining woodlot is thus left to continue production, unimpaired by grazing.

Damage done by needless grazing varies according to woodlot size and the number of animals raised on them. However, regardless of either of these conditions, continued grazing virtually ruins a woodlot, since it removes the whole succeeding stand along with its progressive increase in growth measured in wood volume. Though the harvest period of a woodlot is beyond the lifetime span of the property owner, making it difficult for him to appreciate his loss through grazing, that loss remains, probably in the hands of the owner's heirs.

A woodland is doomed where conditions persist which will not permit natural regeneration. After a time, with no new growth to replace larger trees which die of natural causes, the canopy begins to open up. Sunlight then can dry out the soil, weeds and grasses gain a foothold and a sod begins to form.

In general, tree seeds which germinate cannot compete with an established grass cover. As these conditions progress, the stand becomes open and park-like and eventually the trees disappear, leaving a rough, weedy pasture which cannot be improved without great difficulty.

Woodland grazing affects more than the growth of trees. Soil erosion in the woodland increases as the absorptive capacity and mechanical protection afforded the soil by the litter is reduced. The open canopy exposes the soil to the erosive force of rain and compacted soil forces overland movement of water. Livestock tend to follow trails in the woodland and these often become centres of serious erosion. Thus continued grazing increases surface run-off and soil erosion.

The case against woodland grazing is summed up by the United States Department of Agriculture Yearbook on Soil for 1957:

"Investigators also agree on the low quality of the forage usually produced under hardwoods. Forage volumes are very low, except in open stands, -----, and even there they seldom exceed 500 pounds an acre. Cattle thus reap little benefit, except shade and exercise, from grazing a hardwood forest - and the farmer ends up with a poorer woodlot for timber production and watershed protection."

It can be seen that woodland grazing contributes to soil erosion and increased water run-off, which in turn lower the yield of the land as well as adding to the flood hazard. The quantity as well as the quality of wood products reaching the market is reduced and the poor pasture results in increased costs per cow. These losses affect not only the individual but also the community as a whole. The Authority is therefore justified in carrying out a vigorous campaign of education in woodland improvement and also in offering direct assistance to woodlot owners. It is recommended that the Authority, through discussions with woodlot owners, should develop a program which will help eliminate the practice of woodland grazing.

3. Forest Fire Protection

The average person does not realize the seriousness of damage caused by fire in the woodlot. Though he may know that young growth and small trees are burned by surface fires he does not realize the extent of the less obvious damage such as the destruction of humus which itself preserves the condition and water-retaining capacity of the soil. When the humus and ground cover are destroyed the sun and dry winds remove the moisture required for tree growth and plant nutrients are destroyed. The heat of the fire also injures the growing tissue inside the bark of older trees which are not actually burned, exposing the wood to attack by insects and fungi. Even though through time the wounds may be completely healed, the damage shows up as defects when the tree is cut for lumber.

The first step in fire control is fire prevention, and the best assurance of prevention is an enlightened public opinion which will make every member of the rural community conscious of the seriousness of the fire damage and of his duty as a citizen to do all he can to prevent it. The farmer can prevent most fires in farm woodlots if he exercises the same care that he does around his home and buildings. It is particularly necessary to exercise such care in areas which have been cut recently, since the accumulation of slash creates a serious fire hazard. Close utilization of tops and the scattering of slash so that it lies close to the moist ground and rots faster will help to reduce this danger.

From the evidence collected in the northern states of the United States, where conditions most nearly approximate those of rural Southern Ontario, it is apparent that the most effective fire protective systems are those set up under the following conditions:

(a) Where the system is organized under the direction and control of the state forester and the wardens in each township are appointed by him on the recommendation of the local council.

(b) Where wardens paid an annual retainer are actual residents in the locality. Usually they are farmers who have had practical instruction in fighting fire. They have the power to call out other local residents to help in fire-fighting and maintain a store of fire-fighting tools on their premises.

(c) Where the warden is assisted in his work by all members of the community. That is, his address and telephone number are known to everyone and fires are reported to him immediately.

(d) Where designated members of the community know that they are likely to be called on to fight fire and are paid so much per hour for the time they are so employed.

(e) Where every resident is thoroughly fire-conscious and realizes that loss of timber by fire is a loss to the whole community, and considers it his duty to prevent, report and fight fire.

(f) Where fires for burning brush and rubbish may be set only after a permit has been obtained from the local fire-warden.

Such a system might be adapted to the more heavily wooded areas in the north and eastern sections of the Otonabee region. It is therefore recommended that the Authority set up a committee to determine the best method of providing fire protection for public and private lands, through the co-operation of the Department of Lands and Forests, for the protection of woodlands in those sections of the Authority area.

4. Protection from Insects and Diseases

In projects such as the public and private reforestation recommended for the Otonabee region, careful consideration should be given to the prevention of outbreaks of insects or tree diseases and adequate arrangements made for the immediate application of control measures when these become necessary. While it is not possible to predict accurately the course insects or disease may take under the ever-changing conditions of a newly forested area, there are a number of fundamental principles which, if applied, will greatly lessen their destructiveness.

Large areas of one kind of tree present ideal conditions for an outbreak of insects or fungus disease. Mixing species in the plantation or separating the species in small blocks tends to slow the spread of outbreaks until natural agencies bring them under control or direct control measures can be applied.

It is important to plant only the species of trees suitable to the site and existing growing conditions.

Healthy, vigorous trees are certainly more resistant to attack than weak, struggling ones.

Over-mature and dead trees should be removed from the existing stands as these harbour bark-beetles and wood-boring insects which may become excessively abundant and attack healthy adjacent trees. Fungus infections may likewise spread from such sources.

Care should be exercised to prevent ground fires. Even light ground fires are frequently followed by severe outbreaks of bark-beetles and wood-boring insects and fungus infection at the base of the trees.

It is essential that an inspection be made each year so that any abnormal increase in insects or disease may be noted and control measures initiated before the outbreak becomes serious. Prompt action may reduce control measures to a comparatively easy task and confine damage to a small area.

(a) Some Important Insect Pests

The White Pine Weevil has caused serious damage to plantations by attacking the leading shoots of young white pine. As this insect prefers to work in full sunshine, white pine should be grown in a mixture with some other species which will shade the pine in its early years.

In recent years the European Pine Shoot Moth was increased to epidemic proportions in red and Scotch pine. Investigations are under way but no simple and effective control measures have yet been discovered. Another enemy of these species, the Root-collar Weevil, has recently caused serious damage in some plantations. This insect kills young trees by girdling them below the ground. Certain insecticides applied around the base of infested trees are said to give good control.

Leaf-feeding insects may kill conifers by one complete defoliation and hardwoods by defoliation for three years in succession. However, even partial defoliation may so weaken trees that they will be attacked by other enemies. Protection

from leaf-feeding insects is therefore desirable. This is the kind of attack against which spraying is most successful.

Since investigations of forest insects are constantly under way, the owner considering insect control should always check with the Zone Forester to find the most effective methods now in use.

(b) Tree Diseases

The chief diseases of the hardwoods are the various trunk, butt and root rots, and chronic stem cankers, which are all endemic and may cause serious damage under aggravating conditions. Woodlots in the Otonabee area present very diverse conditions with respect to the incidence of these diseases, a circumstance which is usually related to their past history. Thus many containing old timber are in need of heavy preliminary salvage and sanitation cuttings as a result of mismanagement or neglect. Such cuttings should precede or be combined with cleanings and improvement cuttings designed to improve the composition and structure of the stands. Having established a sanitary condition, normal care should maintain it and obviate loss on account of decay.

The wood rots are commonly thought of as diseases of mature and over-mature timber, but experience has shown that infection may occur at a very early age. In hardwood sprouts the stem may be infected from the parent stump. In older trees infection is chiefly through wounds, either of the root or trunk, which may be caused by fire, trampling by animals, insects, meteorological agencies, or by carelessness or accident in felling and other woods operations.

For many reasons "cleanings" in the reproduction are desirable, especially where the woods have been heavily cut. Besides favouring the valuable species, those stems which are of seedling origin should be favoured over stump sprouts which are more liable to decay.

In harvest cuttings, which should recur at frequent intervals, the permissible volume allotted should include trees in which incipient decay is discovered and so far as possible those which have become a poor risk through injury or other circumstances.

The white pine blister rust is a serious enemy of that important species. It can be controlled by elimination of the currant and gooseberry bushes which spread the disease. This is economically feasible where white pine is growing on good sites, and where a considerable concentration of white pine on a small area reduces the labour involved.

The Dutch elm disease, which causes rapid wilting and death to all native elm trees and most introduced species, has caused great concern ever since the first discovery in Canada in 1944. It appeared first in Quebec, then at Windsor somewhat later and has subsequently spread over a large part of Southern Ontario. A survey during the summer of 1958 in the Metropolitan Toronto area revealed that the disease is well established there.

In 1959 two cases of the disease were confirmed in the Otonabee Region Conservation Authority, one in Lakefield and one in Otonabee Township. In 1960 two cases were confirmed in the city of Peterborough.

Control is achieved by elimination of diseased trees and by spraying healthy trees to prevent attack by the elm bark beetles which carry the disease. For valuable trees in parks, along streets or around houses the cost of control is well within reason.

Because elm covers a considerable area of the watershed's woodland the Authority should alert its member municipalities to the danger and co-operate with them in making plans to control this disease.

5. Windbreaks and Shelterbelts

In the process of clearing land for agriculture, woodlots and belts of trees along fence lines have been removed which had served as natural shelterbelts. The restoration of these in the form of windbreaks is essential to a complete conservation program in many parts of Southern Ontario.

When proper species are used and windbreaks are correctly placed the effects are almost entirely beneficial. The effects may be direct or indirect, but in either case are the result of reduction in wind velocity. The effects of windbreaks on crops and cultivated fields may be listed as follows.

(a) Direct Effects

- (1) Wind damage and lodging in small grains and corn is reduced or eliminated.
- (2) Snow and the resultant moisture are more evenly distributed over fields, particularly on the higher spots where they are required most.
- (3) Wind erosion of the soil is minimized.

(b) Indirect Effects

- (1) Moisture loss by evaporation is reduced.
- (2) Temperatures in the fields are raised; which may prevent frost damage, accelerate growth and even lengthen the growing season slightly.
- (3) Erosion of the soil by water may be reduced by its more even distribution when released from snow.

The benefits of windbreaks to buildings in reducing heat loss in winter have been shown to be considerable. Experiments conducted in the United States proved that more than twice as much heat is lost from a house with a wind of 20 m.p.h. as with one of 5 m.p.h., and a windbreak can easily reduce wind velocities in this proportion. Used in this way they can often be made to form an effective background for the house and protection for farm buildings. Another advantage of windbreaks is that they provide shelter and runways for insectivorous birds and other small animals.

Belts of trees comprising one or two rows are usually called windbreaks, and with more than two rows, shelterbelts. In Southern Ontario windbreaks as a rule give sufficient protection except where wind erosion of soil on rolling land is severe, when shelterbelts may be required. On level land windbreaks may nearly always be established along existing fence lines, but on rolling land consideration should be given to the contour of the land. The prevailing winds in Southern Ontario are generally from the west, so that the greatest protection will be derived from windbreaks on the west side, but the placement of windbreaks on the other three sides as well should be considered.

Both the height of the trees and the wind velocity influence the effective range of a windbreak. An average windbreak will reduce the ground velocity of a 20-mile wind 10 per cent or more for a distance of about 30 times the height of the trees. About one-fourth of this effect will be felt on the windward side of the windbreak and three-fourths on the leeward side. For example, if the trees are 40 feet high the total effective range with a 20-mile wind will be 30×40 or 1,200 feet, 300 feet of which will be on the windward side and 900 feet on the leeward side. Generally speaking, the reduction in velocity is greatest close to the windbreak and tapers out to zero farther away. With higher wind velocities and/or higher trees the proportionate reduction and the effective range will be greater.

A few years ago European alder gained considerable popularity as a windbreak tree because it is a nitrogen-fixer like the legumes and does not rob the soil to the same extent as non-nitrogen-fixing species. At the present time stock is hard to obtain.

One consideration that should be kept in mind is that under certain circumstances windbreaks may cause air stagnation, which may increase temperature and moisture

AN ADAPTATION OFA WINDBREAK PATTERN TO HILLY TOPOGRAPHY

-LEGEND-

WINDBREAKS

ROADS

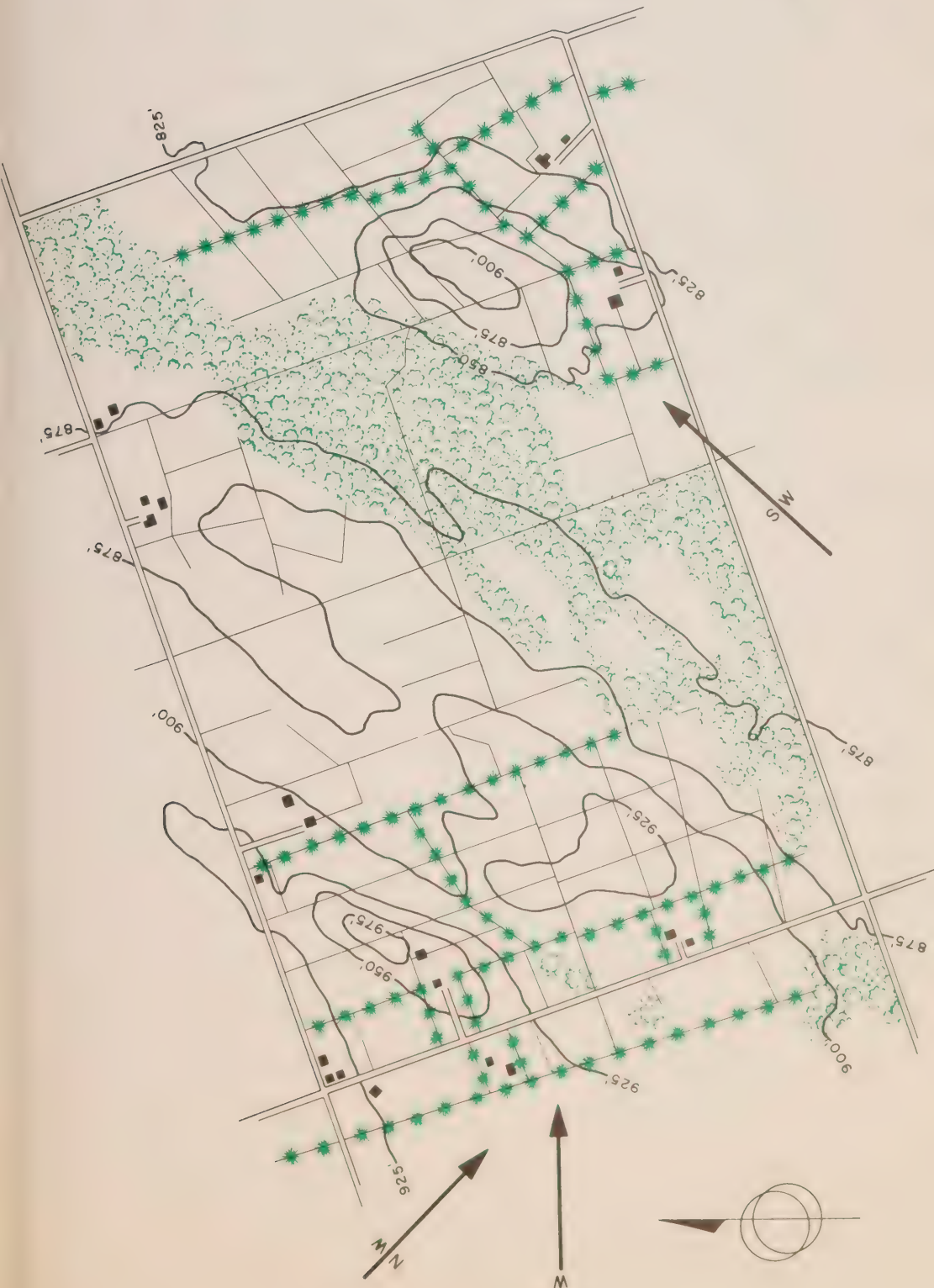
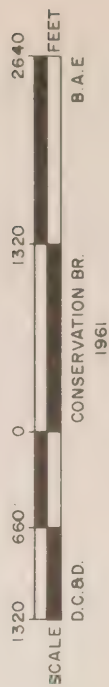
BUILDINGS

FIELD BOUNDARIES

CONTOURS

WOODLAND

PREVAILING
WIND DIRECTIONS



conditions to a dangerous degree in summer or increase frost damage in spring and fall on small areas, particularly in hollows. Where this is likely to occur, windbreaks should be planted so as to guide the flow of air past such spots. Where these conditions develop after the windbreaks are established they may be relieved by judicious opening up of the windbreaks.

Experience has shown that windbreaks are an asset to any farm, that their adverse effects, if any, are local and easily remedied, and that in many areas they are essential to the control of soil erosion by wind. It is therefore recommended that the Authority encourage in every way the establishment of windbreaks by private owners.

6. Snow Fences

In the climate of Southern Ontario snow drifting may cause much inconvenience and sometimes hardship. Control can be readily affected by means of windbreaks and is dependent on proper placing with reference to lanes of travel and topographic features.

Where space is limited or land valuable, lath or board fences are frequently used, but the cost of erection, removal or maintenance of these can be materially reduced by using trees as permanent windbreaks or shelterbelts.

The object of a snow fence is to mechanically reduce wind velocity near the ground in such a manner as to cause a drift to form where it will be least harmful. The reduction in velocity creates two pools of relatively calm air, a small one on the windward side and a much larger one on the leeward side, and it is here that drifts form, leaving the area farther to the leeward free of drifts and comparatively free of snow. As winds become stronger the wind reduction and the width of the calm pool on the leeward side will increase and the centre will tend to move farther away from the windbreak.

A wide belt of trees which will accumulate a large drift of snow on its windward side may be planted right

to the edge of the road, the windward edge extending back a distance equal to three or four times the height of the trees, and generally at least 100 feet.

In some places the snow trap type of windbreak is effectively used. It is composed of one or more rows of trees close to the road with a wide opening to windward and then a single row of trees. The single row arrests the first force of the wind and the snow is deposited in the opening. This has the advantage of requiring **fewer** trees than the shelterbelt and leaving the ground between open for cultivation in the summer.

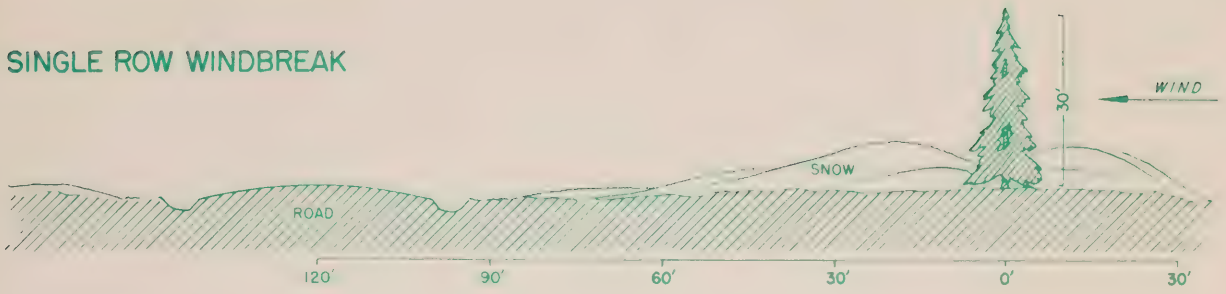
Poor placement of windbreaks may accentuate drifting conditions. A single row of trees, unless it is a dense coniferous type, is seldom dense enough to completely stop winter wind, and may create drifts.

Any prejudice which may exist against windbreaks for protection against drifting snow on roads arises from such poor or poorly placed windbreaks. If a windbreak has openings in it or if it ends abruptly streamer drifts will form. Windbreaks should be kept dense and tapered down at the ends by using progressively smaller species of trees and shrubs to prevent the formation of streamer drifts.

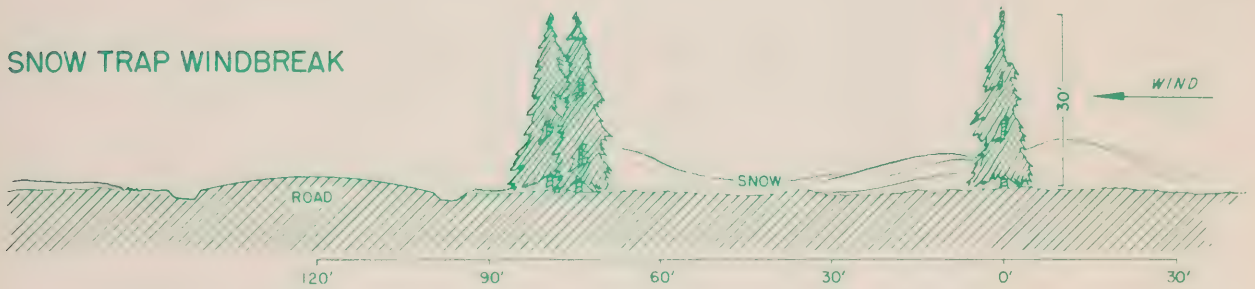
Trees are being used successfully as snow fences in Ontario by the Department of Highways, by railways and by a number of counties. Every encouragement should be given to the establishment of such snow fences in place of the removable type of lath fence now in use.

SNOW FENCES

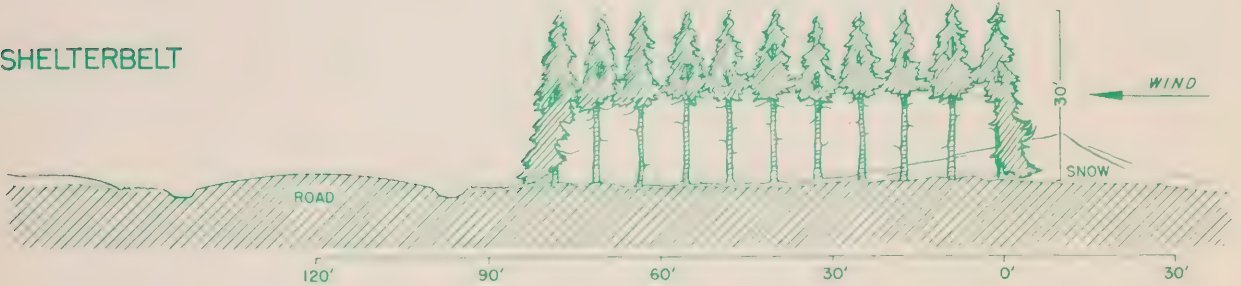
SINGLE ROW WINDBREAK



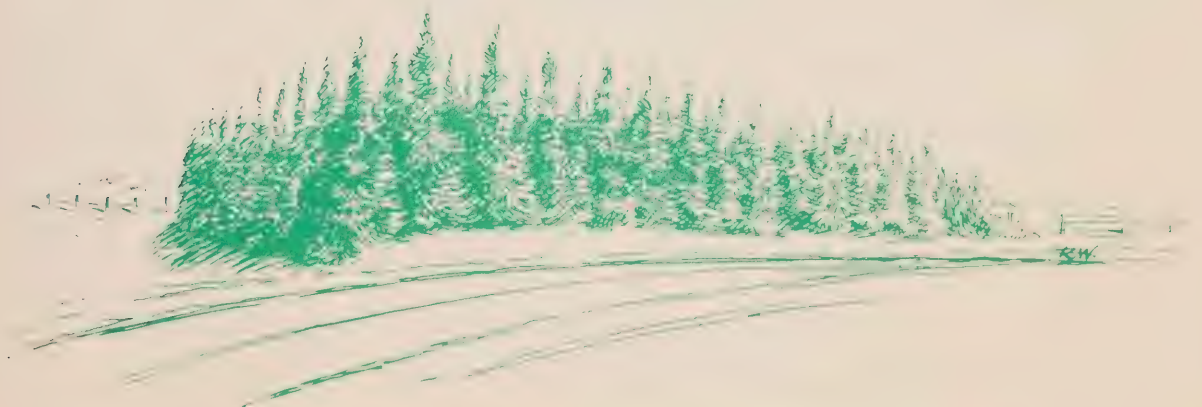
SNOW TRAP WINDBREAK



SHELTERBELT



CROSS SECTIONS OF ROAD AND SNOW FENCES



Two methods of preventing drifts at the ends— left end of shelterbelt terminates at a hollow, right end is tapered down to the ground.

CHAPTER 6

MARKETS AND MARKETING

Although no complete survey was made of the wood-using industry in the Otonabee region, even a limited investigation shows that local sawmilling has dwindled rapidly because of decreasing wood supplies. The mills which remain operate only part time, doing custom sawing for local farmers for much of their work. At the same time industries in the towns of the area, such as building material firms, are bringing wood from other regions rather than shopping for meagre local supplies. In the absence of assured local markets, woodlot owners are discouraged in caring for the remaining woodland, thus further reducing wood supplies and exaggerating poor market conditions.

This trend can be reversed. Improvement of woodlots and planting of unproductive areas are obvious means of increasing production which were discussed in earlier chapters. In addition any woodlot owner should know enough about harvesting and marketing his products to get the most out of his present production.

The breadth of the market varies greatly with quality. For high-grade products, such as veneer logs, buyers will come one hundred miles or more. For low-grade logs, 20 miles may be the limit, and often it is difficult to find a buyer at all.

This difficulty applies to all low-grade or small material which the owner should remove to improve the growth of quality material in the woodlot. The market for fuelwood has declined sharply in the face of competition from other fuels but this use still remains of some importance. A pulpwood market for thinnings now exists. Recent advances in the pulp and paper industry have made possible the use of hardwood thinnings. This type of market does not promise large returns to woodlot owners, but it does promise to defray the cost of woodlot improvements which will allow the progressive owner to produce the quality products from which his real profits are derived.

The importance of quality products is well illustrated by the comparison made in a Department of Lands and Forests news release which is quoted in part below:

"There is no commodity produced on a farm which will vary as much as wood ... Our woodlots and pine plantations in Southern Ontario yield a variety of products. In order to compare their relative values, it is necessary to arrive at a price per cubic foot of wood for each product. The following prices should not be taken as exact, as they will vary with quality, quantity, ease of logging and the bargaining power of the landowner. However, these prices will serve to show a comparison of net values from various products. Fuelwood, at \$1.00 per short cord is worth about 4 cents per cubic foot. Pulpwood from pine thinnings at \$2.00 per full cord is worth about 2 $\frac{3}{4}$ ¢ per cubic foot. Small pine logs from 6 - 8" in diameter at 3¢ per running foot are worth about 9¢ per cubic foot. Cedar posts 8' long, having a 5" top at 20¢ each are worth about 10¢ per cubic foot. Small sawlogs 10 - 15" in diameter, of valuable species, such as hard maple, oak, ash, etc., at \$40.00 per thousand board feet, Doyle Rule, are worth about 16¢ per cubic foot.

"Large sawlogs of less valuable species, such as elm beech, soft maple, averaging 20" in diameter, and valued at \$25.00 per thousand, Doyle Rule, are worth about 17¢ per cubic foot.

"Good quality sawlogs of hard maple, pine, oak, etc., averaging 20" in diameter at \$60.00 per thousand board feet, Doyle Rule, are worth about 40¢ per cubic foot.

"Veneer quality logs of maple, oak, cherry, etc., averaging 22" in diameter at \$90.00 per thousand board feet, Doyle Rule, are worth 65¢ per cubic foot."

1. The Timber Harvest

Harvesting of timber involves four operations: estimation of volume, cutting, skidding and hauling. The owner may perform all operations, selling his logs at the mill; he may cut and skid the logs, selling them at the roadside; or he may sell his timber on the stump.

(a) Estimating

Estimation of timber may be done either in the tree (cruising) or in the log after cutting (scaling).

Some operators cruise timber by rough ocular estimate; that is, by walking through the bush and estimating, on the bases of past experience, the number of board feet in the stand. The most accurate method would be to measure each tree, consider taper and defect, estimate and tally its volume. In large wooded

tracts only a representative sample, say 10 per cent or 20 per cent, may be measured and the total estimated from this sample.

One example may illustrate the value of a tallied cruise. Some years ago, in competitive bedding for 87 acres of woodland, one operator estimated a stand by tallying every merchantable tree, to be 700,000 board feet; the chief log buyer for a large furniture manufacturer estimated 350,000 board feet; another operator estimated 100,000 board feet. The actual cut from the stand was 746,000 board feet. Obviously such discrepancies are of concern to the seller as well as to the bidder who tries to maintain his place in competitive buying. Before selling standing timber, it would pay the owner to make a tallied cruise or, if necessary, to hire professional assistance for this purpose.

Similarly, when selling logs, the owner or his agent should assist in their measurement, try to understand the allowance which must be made for defects and assure himself that he is being fairly treated.

(b) Cutting and Skidding

In a typical hardwood operation, the value of logs at the roadside may be half as much again as that of logs in the standing tree. The difference is mainly labour cost.

By performing the operations of cutting and skidding, the farmer increases his return by selling his labour and use of his equipment instead of just his stumpage. The flexibility of woods work in fitting into otherwise slack seasons on the farm should make this increased return particularly attractive. In addition, the farmer doing his own cutting is best able to determine that the right trees are removed and damage to the remaining stand kept as low as possible.

(c) Hauling

Truck-hauling has increased the distance from which mills can secure their logs. Cost per thousand board feet hauled depends largely on distance. Thus while grade 1 logs

might be hauled up to 50 miles, the lower value of other logs might limit practical hauling distance to 15 or 20 miles.

While actual figures will vary greatly, the example below will suggest the change in log value at various stages.

Value of logs in the tree	
(stumpage)	\$28 per M board feet
Making logs from tree	8 " " " "
Skidding logs to road	6 " " " "
Hauling logs to mill	8 " " " "
<hr/>	
Value of logs in mill yard	\$50 per M board feet

2. Timber Sales

(a) Outright Sale of Woodlot

Frequently a sawmiller finds the simplest procedure is to buy the woodlot or farm outright. In this case, the former owner had no further interest in the land. The practice of slashing such woodlots and leaving them to become tax-delinquent is legitimate cause for community concern. Where tree-cutting by-laws are rigidly enforced, this abuse should be kept under control.

(b) Sale of Cutting Rights

Under this method the owner sells the right to cut all timber of certain species down to a certain diameter; or the trees to be cut may be marked in advance and the sale made on this basis. Often only a very vague word-of-mouth agreement is made and misunderstandings are common. A simple written agreement such as that suggested later in this chapter would avoid this confusion.

A lump-sum method of payment is often used on such sales, based upon a volume estimate by the buyer. As mentioned in the section on cruising, the volume estimates of different bidders may vary considerably. The seller is therefore advised to consult the list of buyers of woodland products in the hands of the Zone Foresters and to obtain competitive bids from as many buyers as possible. On lump-sum purchases the buyer takes all the risk as to accuracy of estimate and quality of timber.

Selling the standing timber at a rate per thousand feet removes the uncertainty of volume estimates and requires measurement of the logs after cutting. Two uncertainties remain - the log rule to be used in measurement and the assignment of logs to different grades which differ in prices per thousand board feet. For Provincial Government transactions the new Ontario Log Rule is now required, but for private sales there is no set standard, the Doyle Rule being most commonly used. The general adoption of the more accurate Ontario rule in timber transactions would be much in the interest of private timber owners on the watershed. The woodlot owner seldom knows the problems of processing logs into lumber sufficiently well to understand fully why the buyer assigns some logs to lower grades. Publication of price lists and grade specifications by log buyers would promote better relations with woodlot owners. Possible arguments and ill-feeling over these matters are factors in making some buyers prefer lump-sum purchase. The woodlot owner must decide whether to accept volume and grade risks in the hope of getting a better price by selling on a log measurement basis.

In the event that he chooses to be paid on a volume-removed basis, just what the buyer intends to cut and pay for should be absolutely clear. Only the best trees might be removed, and it is possible that only the best logs from these trees might be taken. This leaves the owner with many poor-quality logs which he cannot readily sell and with some poor trees standing which he wanted cut. The volume actually paid for might be small, and the woodlot owner's total realization on the transaction might be less than he would have received had he accepted payment in a lump sum.

No matter which of these two methods is chosen, a written Timber Sale Contract should cover the transaction. It should set forth all the details necessary as to prices, species, sizes, rights granted to the buyers, limiting dates, times of payment and so on.

(c) Owner-Made Logs

The woodlot owner who has decided to realize not only the value of his woodland product but also the additional labour income derived from its harvest prefers to take payment at a price per thousand board feet for logs placed on skids at the roadway or logs delivered to the mill. Here again the securing of competitive bids and a clear understanding with the buyer regarding log grade will avoid any feeling of unfairness in the deal. An owner who simply arrives at the mill with a load of logs may feel that he has to accept the offered price even though he is dissatisfied.

3. Timber Sale Contracts

As an aid to people who are unfamiliar with timber sales agreements, a sample contract is given here. It shows the more important provisions that should be included in a contract for the sale of marked trees, to be scaled in the log. Substitute clauses are given for use in other kinds of sales. No single form of contract will suit all classes of sales, but owners of woodland timber should have no difficulty in adapting this contract to their use.

SAMPLE TIMBER SALE CONTRACT

Agreement entered into on this day of
between of
hereinafter called the seller, and of..
..... hereinafter called the purchaser.
Witnesseth:

ARTICLE 1. The seller agrees to sell the purchaser, upon the terms and conditions hereinafter stated, all the living timber marked or designated by the seller and all the merchantable dead timber, standing or down, estimated to be board feet, more or less, on Lot Con. in the Township of County of and located on a farm owned by the seller and about miles from

ARTICLE II. The purchaser agrees to pay the seller the sum of.....more or less, as may be determined by the actual scale, at the rate of.....per thousand feet.....;.....payable prior to the date of removal of material, in instalments of each.

ARTICLE III. The purchaser further agrees to cut and remove said timber in strict accordance with the following conditions:

1. Unless an extension of time is granted all timber shall be cut, paid for, and removed on or before.....

2. Saw timber shall be scaled by the log rule, and measured at the

3. The maximum scaling lengths of logs shall be 16 feet; greater lengths shall be scaled as two or more logs. Upon all logs an additional length of 4 inches shall be allowed for trimming. Logs over-running this allowance shall be scaled not to exceed the next foot in length.

4. No unmarked timber of any kind shall be cut, except

5. Stumps shall be cut so as to cause the least possible waste - stumps of trees up to 16 inches in diameter, not higher than 12 inches above the ground, and those of trees above this size at a distance above the ground not greater than three-fourths of their diameter.

6. All trees shall be utilized in their tops to the lowest possible diameter, for commercially saleable material.

7. Young trees shall be protected against unnecessary injury; only dead trees and less valuable kinds may be used for construction purposes in connection with lumbering operations.

8. Care should be exercised at all times by the purchaser and his employees against starting and spreading of fire.

9. All slash shall be disposed of by the method of lopping and scattering.

ARTICLE IV. It is mutually understood and agreed by and between the parties heretofore mentioned as follows:

1. All timber included in this agreement shall remain the property of the seller until paid for in full.

2. In case of dispute over the terms of this contract, final decision shall rest with a reputable person to be mutually agreed upon by parties to this contract, and in case of further disagreement, with an arbitration board of three persons, one to be selected by each party to this contract, and a third to be the Zone Forester or his chosen representative.

In witness whereof the parties hereto have hereunto set their hands and seal this.....day of.....19.....

Witnesses:

.....
.....

The following are sample clauses that should be substituted in the contract when other methods of sale are used. In lump-sum sales substitute in Article I a descriptive clause modelled on this one:

All merchantable living trees, except.....
..... which measure 12 inches or less in diameter at breast height (a height of $4\frac{1}{2}$ feet above the ground).

Such provision will reserve the basis of a second crop consisting of the more valuable and rapid-growing kinds of trees and remove all the inferior and slower-growing trees.

The payment clause in lump sum sales should be varied to read somewhat like this:

The sum of dollars for said timber, payable prior to the cutting of the material, in instalments ofdollars each, payable on or before.....
.....respectively.

4. Attempts at a Solution of the Marketing Problem

Orderly marketing of woodland products is to the advantage of the woodlot owner, the sawmill operator, and the ultimate industrial consumer who requires definite quantities of certain species in certain grades to carry on his manufacturing business. It has already been remarked that the farmer feels at a disadvantage in marketing logs, and his real or imagined grievances are a detriment to good relations between the buyer and seller of logs and a steady flow of logs to the market. The following attempts at improved marketing may suggest methods which could be applied in the Otonabee region.

(a) A Marketing Experiment near Doon

During the winter season of 1948 and 1949 the Department of Lands and Forests in the Galt Zone carried out an experiment in the marking and marketing of timber in an 18-acre woodlot near Doon. The project was initiated by Mr. I.C. Marritt, the District Forester, and the field work was done by Mr. L.S. Hamilton, Zone Forester. The Scheme is patterned after a marketing assistance method meeting good success in the State of New Jersey.

The mixed uneven-aged woodlot contained considerable large white pine and red oak. Initial investigations by the Department showed growth stagnation due to over-stocking and recommended the removal of certain trees representing the accumulation of growth over a number of years. Under this condition, removal of selected trees allows the remaining trees to grow at an increased rate. As growth again slows down, another cropping should take place. This is the simple principle of selective

logging - the removal of accumulated growth periodically to keep the stand at a healthy, productive growth rate.

Upon explanation of the proposed marketing assistance, the woodlot owner entered into a signed agreement with the Department as a co-operator, agreeing not to sell or allow to be cut any trees except those marked, upon penalty of a nominal fine per thousand for the estimating and marking service of the Department.

The trees were marked with a view to a second marking which would be necessary afterwards to remove weed trees and trees of low value in order to give good growing conditions. Each tree marked for removal was blazed at breast height and below stump height, the stump blaze being branded to detect any unauthorized cutting. The total log scale estimated for the 223 trees marked was 47,600 board feet, Doyle Rule. The trees were listed as to species and diameter on a mimeographed form.

All the estimation data were turned over to a timber agent chosen by the Department. The timber agent entered into a written agreement with the owner to -

- (1) solicit tenders from buyers:
- (2) draw up a timber sale contract protecting the owner;
- (3) check on cutting operations; and
- (4) measure and collect payment for all wood cut before its removal from the property.

The agent was to receive a percentage commission of the gross sale value.

The timber agent mailed the volume estimate sheets to all local log buyers, giving location of the woodlot and inviting inspection of the bush.

The timber sale contract set forth the prices agreed upon for the different species, required that tops be worked into 4-foot wood to be paid for at an agreed price per standard cord, provided penalties for the cutting of unmarked trees and required that the woods operation be conducted with a minimum of damage to the woodlot.

Prices realized by the owner were much better than the average paid in the area. Prices per thousand board feet, Doyle Rule, for the standing timber were:

White and red oak.....	\$62
White ash, soft maple, hard maple, basswood and cherry.....	\$60
White pine.....	\$55
Hemlock.....	\$45
Beech.....	30
Fuelwood.....	\$4 per standard cord.

The experiment was considered very successful by all the parties concerned, yielding about 2,000 board feet more than estimated, and the woodlot has been left in fine growing condition with an expected second cut in 15 or 20 years of 25,000 board feet.

(b) The Lanark County Co-operative

This co-operative was set up by a group of woodland owners in the County of Lanark in March, 1950. Its objective is the better management of privately-owned woodland to ensure a continuous yield of the best material possible from the forested land of the members through profitable marketing of all the woodland products.

To put the woodland enterprise on a paying basis to the individual, it is necessary to market not only the material suitable for lumber manufacture and special products such as veneer but also the inferior products such as the poorer hardwood species, low-grade hardwood logs of the better species, small softwood products such as cedar posts and poles and that material removed in improving a woodlot during what may be called sanitation cutting. It was felt that the advantages of co-operative action by woodland owners in the field of marketing would best solve the problems of the individual, particularly in respect to inferior or small products. Acting as a group rather than individually and through a member active in contacting

prospective buyers, they can hope for recognition by the buyers in the area as a stable source of the various woodland products.

The establishment of the co-operative followed an extensive educational **campaign** carried on by fieldmen of the Federation of Agriculture, the Department of Lands and Forests and the local Farm Forum leader. Interest was aroused through moving pictures, talks at schools, local evening meetings, press releases, radio programs and public speaking competitions on woodlot management. Meetings held at Lanark were attended by officers of the Department of Lands and Forests; representatives of pulp and paper companies, sawmills and other wood-using industries; and members of agricultural organizations. Gradually a workable plan was evolved, and the Lanark Forest Co-operative was set up under a number of directors with Mr. Herb. Paul as manager.

Mr. Paul, of Lavant, the main force behind the formation of the co-operative, is an energetic leader of the local Farm Forum, caretaker of the Lanark County Forest, a farmer, and owner of several hundred acres of woodland in Lavant Township. As manager of the co-operative his duties entail the location of markets for the woodland products of the members, arriving at satisfactory price schedules, collection of payment for products, ensuring that products are ready or delivered at the time promised and advising members on cutting their woodland according to best forestry practices.

The co-operative had a membership of approximately 60 in the fall of 1950. By April of 1959 the membership had grown to about 250 with an average holding per member of about 200 acres. A lifetime membership fee is \$5.00 and in addition the co-operative receives a commission of 5 per cent of the sales. An indication of the success of this venture is the fact that the co-operative has accumulated enough funds to make advances to producing members while wood or logs are being manufactured.

At present the co-operative has no intention of undertaking a manufacturing endeavour such as a sawmill for lumber or railway ties. Logs are not accumulated at a central point and sorted as to species and a grading standard, but are handled direct from woodland to buyer. The purchaser's measure of the volume, by grade where it might apply, is accepted as the basis for payment on transactions.

In addition to its main function of promoting forest conservation and finding markets at the best prices for forest products, the co-operative has other activities. Since 1954, with financial aid from two prominent pulp and paper companies, the co-operative has sponsored a woodlot management competition among its members. Winners in the competition are honoured at an annual banquet and given framed certificates and cash awards. In 1956 the co-operative formed a tree farm committee in Lanark County and this project has resulted in 25 woodland owners being certified as tree farmers by the Canadian Tree Farm Committee.

It would seem that the Lanark Forest Co-operative has progressed a long way toward accomplishing its objectives of promoting the better management of privately owned woodland and of benefiting its members through profitable marketing of all woodland products. Such an organization not only promotes good conservation practices but also benefits the economy of the community. It is recommended that the Otonabee Region Conservation Authority encourage its woodland owners in the formation of a similar co-operative, and give its full support and co-operation to such an enterprise.

CHAPTER 7.

THE OUSE WATERSHED SURVEY

1. Introduction

The Otonabee Region Forest Conservation Report, published in 1961, covered those parts of the Region within the jurisdiction of the Authority at the time of the original survey. Subsequently the Ouse River Watershed, in the eastern part of the Region, was added to the Authority and the present supplementary report covers this section. The Ouse River Watershed, like the remainder of the Region, lies within the Huron-Ontario Section of the Great Lakes-St. Lawrence Forest Region in which the major association of forest trees on the better soils is dominated by sugar maple and beech. It was noted that the common forest on specialized sites such as river bottoms and swamps may be an association dominated by white cedar and elm. On the Ouse Watershed this latter condition actually occupies as large an area as the climax type.

2. Physiographic Features

Of the four major physiographic divisions in the Otonabee Region only two are represented within the Ouse River Watershed. These are (a) Peterborough Drumlin Field, and (b) Dummer Moraine.*

On the Peterborough Drumlin Field, the most common forest cover on moist and wet low-lying areas is elm and poplar. Cedar is often a major included species in both of these cover types. Sugar maple and sugar maple - beech cover types occur mostly in the higher areas.

In contrast, the forested region of the Dummer Moraine is characterized by shallow, droughty and bouldery soils

* Chapman, L. J. and Putnam, D. F. The Physiography of Southern Ontario, University of Toronto Press, 1951.

over limestone at the edge of the Precambrian Shield, on which the forest cover is chiefly cedar, white elm and poplar.

Additional minor physiographic features in the form of eskers and spillways are also of importance to the watershed. There are two eskers on the watershed running generally parallel to each other from south-west to north-east between Rice Lake and the Village of Norwood. The most important of these narrow sandy ridges is the Norwood Esker, a massive ridge which at times reaches a height of over 75 feet and a slope of about 26°. It is sometimes a compound of two or three ridges lying side by side, although its main body can be followed for about twelve miles. The forest cover on these ridges is chiefly hard maple with small areas of white pine.

Spillways are confined to narrow bands along the two main branches of the Ouse River except near the mouth, where they join to form an extensive area well covered with drumlins.

3. Survey Methods

The detailed forest survey of the Ouse River Watershed was conducted in the same manner as that on the rest of the Otonabee Region. Each area of woodland, scrubland, swamp and rough land was visited and described.

In addition, all private plantations were examined and all land suitable for reforestation was mapped, according to the normal forestry survey methods of the Conservation Authorities Branch. Peterborough County Forest was not examined in the field, but its boundaries as of the year 1962 were mapped.

4. Forest Cover Types

The following forest cover types were encountered on the Ouse River Watershed:

<u>Type Number</u>	<u>Name</u>
3	Red pine
4	Aspen
4a	Poplar - oak
6	Paper birch
9	White pine
10	White pine - hemlock

<u>Type Number</u>	<u>Name</u>
11	Hemlock
14	Sugar maple
21	White spruce - balsam fir - paper birch
22	Balsam fir
24	White cedar
25	Tamarack
50	White oak
57	Beech - sugar maple
60	Silver maple - white elm
60a	White elm
88	Willow

Although 17 cover types were found and identified in the watershed, slightly over 85 per cent of the woodland is contained in four of them. In order of the area which they occupy these types are as follows:

Type 24 - White cedar, occupies 31.9 per cent of the woodland acreage, occurring most commonly on the muck soils of the swamps. As found during the previous survey of the Otonabee Region, the demand for vine poles is sufficient to induce property owners to clear-cut such woodlots, even the smallest trees.

Type 4 - Aspen, occupies 22.4 per cent of the woodland area. As in the remainder of the Otonabee Region, aspen, on the Ouse River Watershed, represents a reaction to various types of cutting operation, over-grazing or fire.

Type 60a - White elm, occupies 15.5 per cent of the woodland area, occurring in the headwater swamps of the watershed and also along the main drainage channels where it has considerable importance in slowing stream runoff. On the Ouse, it forms a smaller proportion of the area than in other parts of the Region. This is because of the large wooded acreage on dry sites unsuited to this type in Dummer Township and the effect of the limestone along the drainage channels of the northern section of the watershed, which favours the growth of cedar.

Type 14 - Sugar maple, occupies 15.5 per cent of the wooded area. It occurs on the upper slopes of the Peterborough Drumlin Field section and also in the Dummer Moraine region, where it is of much poorer quality than the sugar maple on the same physiographic portions of the Otonabee and Indian River watersheds.

In addition there are four other cover types which occupy from 1 to 4 per cent of the woodland area. These are:

Type 9 - White pine, occupies 1.9 per cent of the woodland area. A great deal of it is located on the Dummer Moraine. The white pine on this part of the watershed is generally slow-grown, due to the shallow droughty nature of the morainic soils. On the heavier soils it is usually succeeded by sugar maple, beech, red oak, basswood and white ash, or by other forest types containing a large proportion of these species.

Type 22 - Balsam fir, occupies 3.7 per cent of the woodland area, but it is found mostly in the northern section of Dummer Township. Its associates are chiefly the birches, aspens, red maple, beech and hemlock on upland sites and black spruce, tamarack, red maple, black ash and white cedar in swamps.

Type 21 - White spruce - balsam fir - paper birch, is a type that occupies 3.0 per cent of the woodland area, and also is found chiefly in Dummer Township. White spruce and balsam fir are the key species of this type, though they do not always predominate. Aspen, black spruce, white pine and white cedar are the common associates of this cover type on the Ouse River watershed.

Type 57 - Beech - sugar maple, occupies 2.2 per cent of the wooded area. It is found chiefly on the better soils

of the watershed, particularly in Asphodel, Otonabee and southern Dummer townships. Its associates are normally hemlock, white elm, basswood, white ash and black cherry, with hornbeam an important subordinate, that tends to increase if the type has been grazed. Like Type 14 it occupied the best land originally, but was removed to make way for agriculture.

The remaining forest types found during the survey would be considered traces only, and most of them were found only in Dummer Township.

5. Condition of Woodlands

Woodland within the Ouse River Watershed comprises 33,100 acres or about 40.3 per cent of the total area. It should be noted that $3/4$ of this woodland area is in Dummer Township, particularly the north half of that township. Of this woodland, 38.6 per cent was classified as hardwood, 30.3 per cent as mixedwood and 31.1 per cent as softwood.

Within the present woodland of the watershed, mature and merchantable timber is practically non-existent, with only 35 acres or 0.1 per cent of all stands classed as over 18 inches diameter at breast height. However, in the smaller size classes some trees of merchantable size can be found and can be harvested to reduce competition in these stands.

Coniferous woodlots in the 10 to 18 inch d.b.h. range, the size desirable for posts and poles, make up 2.3 per cent of the total acreage of woodland. In comparison, 10.3 per cent of the watershed's hardwood is in this size class.

Too high a percentage (69 per cent) of the watershed's woodland is in the 4 to 10 inch d.b.h. class, with an additional 12 per cent being in the class under 4 inches. These two classes include 73 per cent of the hardwood, 80 per cent of the mixedwood and 93 per cent of the softwood. The major part of all this acreage of small trees is located on the droughty soils of the Dummer Moraine.

Extensive cutting, both past and present, has helped to create this large acreage of young forest. Such cuttings have left only the young or defective trees to produce future crops, thus slowing down the whole forest development process.

It will take a considerable length of time for these trees to grow to merchantable size. In cases where stands are overstocked, this difficulty can be reduced by regular thinning. However, the remainder of the woodland (53 per cent) is slightly to severely understocked. This is a direct indication of the need for greater care and in some cases for the under-planting and inter-planting of trees to supplement the natural regeneration.

The hardwoods in the 10 to 18 inch d.b.h. class (26.7 per cent) and the mixedwood and conifers over 4 inches d.b.h. (15.2 per cent) will soon reach a merchantable size and should pay for proper management within a short time.

Improvement in natural regeneration is of great importance in achieving better woodlot conditions. On the Ouse River Watershed, only about 15 per cent of the woodland area presently possesses regeneration that can be called good to excellent. The remaining regeneration is fair to poor. Grazing is obviously a prime reason for poor forest regeneration on the watershed, as the survey discloses that 30 per cent of the wooded area has been affected by this practice.

As on the Otonabee and Indian River watersheds, some species, particularly poplar, forming mixtures with the more permanent cover types such as elm and cedar, occupy too great an acreage. These stands will require careful management to increase the acreage of the more valuable permanent forest species.

Within the Ouse Watershed, over 32 per cent of the woodland is even-aged forest. This is due mainly to the presence of a temporary species such as poplar. With proper

and careful management of farm woodlots, many stands of this type can be converted to an uneven-aged condition which will allow a more continuous harvest of timber crops.

However, in areas such as the northern half of Dummer Township where, by reason of its greater area, the woodland is better described as a forest rather than a series of woodlots, systems of even-aged management may be equally applicable. Investigation as to the best method of managing these stands of intolerant tree species would be of great benefit to the area.

White pine is scattered throughout the watershed but the stands are located mainly in Dummer Township. Of the white pine stands present, about half are pure conifer in content and half are mixedwood with white pine being dominant. As regards size, half of these scattered white pine areas are in the 10 to 18 inch d.b.h. class, one quarter in the 4 to 10 inch d.b.h. class, and the remainder in the under 4 inch d.b.h. class. Only 18 per cent of these stands are regenerating well and they are all only fair to poorly stocked. In some cases this condition could be improved by under-planting to supplement the natural regeneration.

6. Scrubland

Scrub cover occupies a percentage of the total watershed area similar to that of the Otonabee and Indian River watersheds. The 2,099 acres of scrub species, such as willow and dogwood on poorly drained sites, and hawthorn and sumac on dry sites, represent 2.5 per cent of the total watershed area. This condition exists mainly on abandoned farm lands and neglected pastures.

Drainage or scrub clearance will restore some of this land for agriculture. Where this is impossible or impractical, the reforestation of scrub areas with timber species will improve productivity.

Distribution of these scrub areas is shown in the following table:

Township	Dry Scrub (acres)	Wet Scrub (acres)	Total Scrubland (acres)
Asphodel	37	829	866
Dummer	572	615	1,187
Otonabee	31	15	46
Total	640	1,459	2,099

CHAPTER 8

CONSERVATION MEASURES IN PROGRESS
AND REQUIRED - OUSE WATERSHED

1. Private Planting

There are only 118 acres of private plantation on the Ouse River Watershed. This would indicate that reforestation on the part of local property owners has been desultory. This acreage represents 22 plantations in all. It is significant that 16 plantations, almost 73 per cent of the total, are 5 acres or under in size. Considering the small average area per plantation and their location, these plantations do not represent a profitable private forest investment or a useful complement to agriculture in the form of windbreaks or shelterbelts.

Scotch pine, a favoured species in private reforestation in the past, has been used in pure stands or in mixtures, mostly with red and white pine, in 13 of these plantations. However, no real emphasis has been placed on Christmas tree growing, as only two of these plantations are presently being used for this purpose.

An equally important consideration when property owners do establish forest plantations is their care and maintenance during the term of growth and development. Pruning, periodic thinning and inspection for various forms of damage are necessary functions of forestry and are particularly feasible for the owners of smaller plantations, since the area involved requires only the occasional effort of a single person in the off-season part of the year.

The use of such practices is notably absent in the few private plantations in this watershed. Since half of them are 25 years old or over, belated efforts on the part of their owners to thin such small plantations now, unless carried out with care, could subject the remaining trees to windfall. However, a large part of the watershed is not only suitable for

reforestation but in need of it, and the Authority might better approach this situation by creating a larger Authority Forest in the strategic positions indicated.

Where small areas require private reforestation, it would be useful to encourage such a program as 4-H Forestry Club projects. There are no such clubs operating in the watershed at present. However, the application of the various simple methods of forest management on a small scale is the usual type of project for club members. The Authority therefore could approach the problem of the small plantation by promoting the formation of 4-H Forestry Clubs on the watershed.

2. The Peterborough County Forest Reserve

The Peterborough County Forest Reserve was created in 1938 when the County leased 2,785 acres of land in Dummer and Belmont Townships from the Crown for a period of ten years.

During this period of tenure the County agreed to spend \$1,000 each year on the forest reserve for survey work, the preparation of work plans, the employment of caretakers, building construction, and necessary equipment purchase. In addition fences were to be erected, firebreaks made and such other improvements as were deemed sufficient and essential for carrying out applied forestry methods were to be undertaken. Nursery stock was also to be planted at the minimum rate of 2,500 trees each year during the lease period and trees removed were to be replaced.

No timber was to be cut for commercial purposes during the lease period unless it was approved by the Minister of Lands and Forests or an accredited official of the Department.

At the end of the ten-year period the County was issued a patent for the reserve on satisfying the Crown that the terms and conditions of the lease had been met. This patent provides that no part of the forest reserve is to be sold or disposed of by the County without the approval of the Lieutenant-Governor in Council.

Additional lands were acquired by the County in both Dummer and Belmont Townships during the lease period to add to the reserve. At last report it occupied 4,374 acres.

Supervision and management of the reserve is done by a Commission appointed by the County Council. Studies and recommendations as to necessary forestry practices have been made by officials of the Department of Lands and Forests, and the reserve has brought in some revenue to the County since 1951.

3. Woodlot Management

The principles of woodlot management and their implementation have been explained in the earlier section of the Otonabee Region Conservation Report (Forest). It should be pointed out that although a large portion of the existing wooded area on the Ouse River Watershed has been recommended to come under Authority ownership, woodlots outside of the Authority Forest will still remain, particularly in Otonabee and Asphodel Townships. In such cases the responsibility of reducing the effects of grazing, of increasing the volume of merchantable timber and of improving the aesthetic values of the farm woodlot rests with the individual property owner.

Public education, demonstrations and designation of properly managed private woodlots as Certified Tree Farms would serve as a means of improving farm forestry on the watershed. Support of the Tree Farm movement by the Authority is recommended, as there are no Certified Tree Farms on the watershed at present.

4. Authority Forest

The recommended Authority Forest on the Ouse River Watershed, covering 39,701 acres, is mainly related to the Dummer Moraine, the Norwood Esker and the shores of Rice Lake and the Trent River.

The two main sections are described as follows:

(a) Asphodel and Otonabee

The Norwood Esker section extends from the junction of the Ouse River with the West Ouse River to the limits of Norwood Village and joins the Dummer Moraine region near the north-east corner of Asphodel Township. It is an area of sandy and gravelly soils that have a low agricultural potential and are subject to erosion. This section, however, would still produce good forest growth.

The remainder of the recommended Authority Forest in this township consists of widely scattered blocks mainly on the shores of Rice Lake, the Trent River and on either side of the Norwood Esker. Some of these properties are partly under natural forest cover now and recommended for Authority acquisition in order that they may receive better management. Others should be purchased by the Authority for the conversion of areas of low agricultural capability into timber production. The one small block in Otonabee Township is also partly wooded.

The total area recommended for Authority Forest in the township is 5,879 acres.

(b) Dummer, Methuen and Belmont

A total of 4,216 acres of that part of Dummer Township south of the east-west Cottesloe road, mainly in the eastern portion of the township, is recommended for purchase. This is rough land unsuited to agriculture, on the southern part of the Dummer Moraine, and should always be in forest cover.

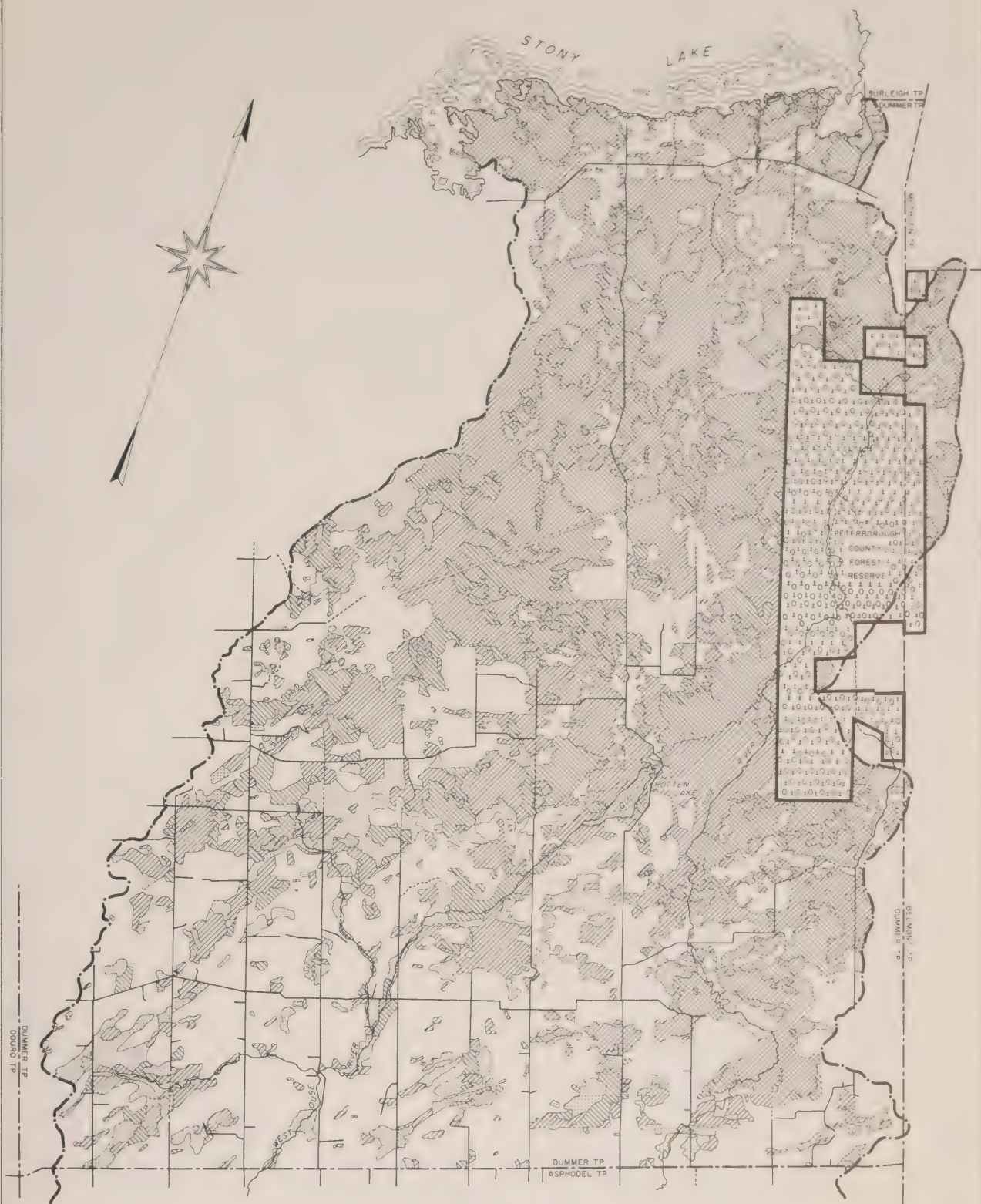
North of the Cottesloe road, most of the remaining section of the township plus the small portions of Methuen and Belmont Townships in the watershed are in some form of forest cover now and should be kept in this state. The recommended area in this section covers 29,606 acres. On the southern edge of the limestone region of this area, the sandy soil in the rough open fields can be returned to useful timber

production through reforestation. These cleared areas should receive some priority in the Authority's forest land purchase program in Dummer Township, along with those properties containing a high proportion of "post and pole" cedar.







In the remainder of northern Dummer Township, largely covered with a slow-growing scrubby forest, there are indications that the present cover lends itself to game management and public hunting. As shown on the accompanying map, a large part of this forest consists of tree species in various size and age classes that are the preferred autumn and winter food for deer. In addition, areas covered with the preferred shrub species for deer browse are present. Authority Forest areas are usually open to public hunting and, indeed, some control of deer population is necessary to prevent excessive browsing of the better species of timber trees. Obviously both forestry and game management should be major considerations in acquiring and operating this section of the forest.

RECOMMENDED AUTHORITY FOREST - ACRES

Township	Open Land	Woodland & Plantation	Dry Scrub	Wet Scrub	Marsh & Water	Total
Asphodel	3,456	2,068		255		5,779
Otonabee	72	28				100
Belmont		600			3	603
Methuen		300				300
Dummer	9,620	22,016	564	477	242	32,919
Total	13,148	25,012	564	732	245	39,701



PART OF
 THE OUSE RIVER WATERSHED
 (OTONABEE REGION)
 SHOWING
 THE RELATIONSHIP OF EXISTING FOREST
 COVER AND DEER BROWSE PREFERENCES

-  PREFERRED DEER BROWSE
-  MEDIUM DEER BROWSE
-  STARVATION DEER BROWSE
-  OPEN LAND
-  PETERBOROUGH COUNTY FOREST RESERVE
-  WATERSHED BOUNDARY



CONSERVATION AUTHORITIES BRANCH, Dept. E & R M., W.J.C. 1964

WILDLIFE

CHAPTER 1

INTRODUCTION

1. Fish and Wildlife in Relation to Conservation

In this report certain basic principles of conservation are assumed. These have long been considered as established, but lingering misconceptions of the meaning of the term "conservation" in relation to fish and wildlife have remained in some people's minds.

Just as conservation includes the wise use of soil to produce an annual agricultural or forest crop in perpetuity, the conservation of wildlife implies the wise use of wildlife to produce where possible an annual crop or harvest from the annual increment. Good conservation practices encompass the improvement of habitat so that the harvestable surplus may, in fact, be increased from year to year. This is important because the number of hunters has greatly increased in recent years.

There is, of course, another value in wildlife, because there is also an ever-increasing number of naturalists, photographers and other private citizens who find their recreation in seeing the varied forms of wildlife in attractive environments. However, if food and cover of the proper kind and quantity are available all game species should be able to provide an annual yield plus enjoyment for the naturalists and the general public. This has always been understood with respect to fish but not always with respect to game and fur.

2. Scope of the Survey

The scope of the wildlife survey was limited to four aspects of conservation in which Conservation Authorities may wish to influence public thinking and action concerning fish and wildlife. These aspects are as follows:

- (1) Various conditions which affect the productivity of game fish in streams.

- (2) The delineation of those wetlands which appear to be of major importance concerning wildfowl.
- (3) Possible improvement of the general wildlife habitat on farms.
- (4) A list (for the benefit of naturalists who live in or visit the Otonabee Region) of what species they may expect or hope to see in the region.

The foregoing does not, of course, cover all the aspects of fish and wildlife. The Fish and Wildlife Branch of the Department manages the fish and wildlife resources of the Province, and the Research Branch is constantly uncovering new factors on which the management of fish and wildlife can be based.

The abundance of wildlife is partly controlled by conditions of the soil, climate, vegetation and the availability of water which, taken together, may be classed as the habitat or living quarters of fish and wildlife. Disease, predators and man's activities are the additional factors of the environment which affect the numbers of fish and wildlife.

The various soils and land types of this area, which affect wildlife habitat, are linked with its four major physiographic features, which may be summarized as follows:

(a) The Oak Ridges Moraine

This ridge is the southern boundary of much of the watershed. The soils are, in general, sandy or gravelly with hilly topography and occasional severe erosion.

(b) Peterborough Drumlin Field

Much of the central part of the watershed is dotted with low, oval, elongated hills, known as drumlins. These are described in detail in the Land Use Report on this region, already published. The soil on these drumlins is a fertile loam or clay loam. The stoniness of drumlin soils

has often prevented cultivation and some of the steeper slopes have never been cultivated. Many of the low areas between the drumlins are used for permanent pasture or woodlots.

(c) Schomberg Lake Plain

South and west of Peterborough, running as far as Millbrook, is an area once occupied by a small glacial lake. The soils are water-laid and may be fine clays, sands or silt. The swamp to the west of Peterborough, locally called the Cavan Bog, is a part of this area.

(d) Dummer Moraine

The north-east part of the Authority area is a region of rough stony land bordering the Canadian Shield (which lies outside the watershed). There are many small swamps in this area. Much of the land has been cleared. The better areas of the moraine are in pasture, but extensive areas should be returned to forest. If this is done the particular needs of various species of wildlife should be considered.

CHAPTER 2

BIOLOGICAL CONDITIONS OF THE RIVERS AND THEIR TRIBUTARIES

The procedure of stream examination followed closely that used by the Conservation Authorities Branch in previous surveys, except that no examination was made of the Trent Canal system. Both from its volume of flow and its origin the part of the Trent Canal in this region and the main Otonabee River were already known to be relatively warm in summer. The remainder of the rivers and their tributaries were examined at stations from half a mile to four miles apart on each stream course. The erosion, vegetation, volume of flow, turbidity, temperature and type of bottom were listed for each station. At all suitable stations collections of the aquatic insects and other invertebrates were made and at most stations collections of fish were also made. The collections were classified and used in zoning the various stream sections as shown on the accompanying map "Biological Conditions of Streams".

Many of the aquatic insects are reliable indicators of the stream conditions at the critical time of year for fish, which commonly occurs in late summer. The fish collections and records of 11 maximum-minimum thermometers and of three continuous recording thermometers substantiated these findings.

The present criteria were developed from more intensive year-round research carried out by Dr. F.P. Ide, of the Department of Zoology, University of Toronto.* The analysis by J.B. Hallam† of previous river surveys by the

* Ide, F.P. The Effect of Temperature on the Distribution of the Mayfly Fauna of a Stream: University of Toronto Studies, Biology 39, Ontario Fisheries Research Laboratory Publication 50, 1935.

† Hallam, J.B. Habitat and Associated Fauna of Selected Species of Fish in Ontario Streams, M.A. Thesis, University of Toronto, 1954.

Conservation Authorities Branch was also useful. The Otonabee and Indian Rivers and their tributaries were examined between June and September, 1960, and the Ouse and its tributaries were examined in May and June, 1962. Most of the streams were examined only once. It was therefore necessary to rely partly on deductions made from the presence or absence of common species known to be reliable indicators.

The main stream of the Otonabee, and the section of the Trent Canal which by-passes the city of Peterborough, are warm streams suitable chiefly for rock bass, smallmouth bass, walleye (or pickerel), largemouth bass and possibly muskellunge, besides some 25 other species of fish of lesser interest which were taken during the summer in other streams in this general area. The same condition is found in the main stream of the Indian River. In the main stream of the Ouse, (the third major stream in the region), conditions are very different, as both of its branches have cool or cold water in their upper sections.

The permanence of flow of all the rivers and streams in the region, together with the normal summer maximum water temperatures, as they affect the distribution of fish, are shown on the accompanying map "Biological Conditions of Streams". The greatest daily fluctuations in temperature are found in the sections coloured green. Brook trout may inhabit some of the green sections but will commonly move to cooler sections or be killed in the warm days of hot summers.

Adult brook trout should thrive best in the lower parts of sections coloured blue. There is little difference in the lethal temperature limits of brook trout and brown trout, but brown trout do grow well in waters 30° to 60°F. warmer than the maximum water temperature for good growth of brook trout. Brown trout will therefore also thrive in the sections of the streams coloured blue and may tolerate some of the green sections shown.

OTONABEE REGION

DEPARTMENT OF LANDS AND FORESTS SURVEYS 1960 1962

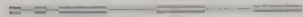
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BIOLOGICAL CONDITIONS OF STREAMS

COMPILED BY MARY K. LUNDSTROM

LEGEND

- PERMANENT FLOW COLD (TEMPERATURE NOT ABOVE 70°F. IN SUMMER)
SUITABLE TO STREAM INVERTEBRATES FOR BROOD STOCK. BROOD STOCK MAY ALSO BE FOUND IN THESE WATERS.
- PERMANENT FLOW COOL (TEMPERATURE 60 TO 70°F. ABOVE THE UPPER LIMIT)
SUITABLE TO STREAM INVERTEBRATES AND TO BROOD STOCK OF A NUMBER OF STREAM INVERTEBRATE BROOD STOCK MAY BE FOUND HERE.
- PERMANENT FLOW WARM (TEMPERATURE 70 TO 80°F. IN SUMMER)
SUITABLE TO STREAM INVERTEBRATES AND TO BROOD STOCK OF A NUMBER OF STREAM INVERTEBRATE BROOD STOCK MAY BE FOUND HERE.
- DRIES COMPLETELY OR TO STANDING POOLS (IN WET WEATHER)



It has now been well established (by Shetter* in Michigan streams, and by Saunders and Smith† in streams in Prince Edward Island), that the establishment of small dams and deflectors to improve depth and cover does actually increase the population of trout (particularly the larger ones) in most streams. In Saunders' and Smith's work the numbers of Age 1 and older trout were approximately doubled.

It therefore appears to be a sound recommendation that the Conservation Authority should either foster the improvement of trout streams by private owners in the Otonabee Region or carry out a demonstration project on a section of a trout stream acquired by the Authority in the course of its conservation work.

It is also recommended that the Authority urge the limiting of trout-stocking to those waters which are shown in this survey to be suitable for trout, and which can be proved to have present populations below the carrying capacity.

1. Distribution of Fish

The following 32 species of fish were found in the rivers and streams of the region during the survey:-

<u>Species</u>	<u>No. of Stations Where Collected</u>
**brown trout	1
**brook trout	15
**muskellunge	1
central mudminnow	20
**white sucker	43

* Shetter, David S., and Clark, O.H., "The Effects of Deflectors in a section of a Michigan Trout Stream". Vol. 76, Transactions of the American Fisheries Society, 1946.

† Saunders, J.W. and Smith, M.W., "Physical Alteration of Stream Habitat to improve Brook Trout Production". Paper read at American Fisheries Society meeting, June 14, 1961.

** Species which may be familiar to the angler are starred. The naming or terminology in the list follows that used in "A List of Ontario Fishes" by W.B. Scott and E.J. Crossman, Royal Ontario Museum publication, Toronto, 1961.



This low dam provides excellent stream improvement for fish. No such improvement was found on the survey of the Otonabee watershed.



An amateur stream improvement device placed in a stream near the Otonabee region. This probably has some good effect in increasing depth and causing a pool at the lower right side of the photo. However it is being undercut and will not last indefinitely.



Part of the large Cattail marsh at the mouth of the Otonabee. The Cattails form a dense mass floating in deep water. It is not possible to walk on them or pass a boat through them. This area might be improved with explosives.

<u>Species</u>	<u>No. of Stations Where Collected</u>
**carp	2
brassy minnow	3
northern pearl dace	33
river chub	1
golden shiner	3
emerald shiner	2
common shiner	32
blackchin shiner	6
blacknose shiner	8
spottail shiner	6
bluntnose minnow	24
fathead minnow	36
blacknose dace	22
longnose dace	21
creek chub	57
fallfish	1
**brown bullhead	5
banded killifish	2
**rock bass	17
**pumpkinseed	12
**smallmouth bass	2
**largemouth bass	7
**yellow perch	11
**walleye	1
mottled sculpin	15
slimy sculpin	1
brook stickleback	67

Many of these species tolerate water considerably warmer than the temperatures considered lethal for brook trout.* The only species for which there is a possible doubt as to the identification comes from the record of several very small muskellunge taken in a small tributary of the Otonabee south of Peterborough. These fish were listed as *Esox* sp., but since muskellunge are, in general, common in these waters and pike rare or absent, they have been presumed to be muskellunge.

A few comments follow on the distribution of the more important fishes. Most of the small tributaries which contain water suitable for trout are scarcely worth fishing. Several apparently do not contain trout at all. The Millbrook stream (Baxter Creek) and Trout Creek, in Cavan Township, contain some first-class trout water and

* Hart, J.S. "Lethal Temperature Relations of Certain Fish of the Toronto Region". Transactions of the Royal Society of Canada, Third Series, Section V. Vol. XLI, Ottawa, 1947.

excellent catches are taken. The upper end of the main or Norwood branch of the Ouse River is a mere trickle at the point marked "A" on the accompanying plan, and no trout were found in it. Brook trout were found lower down at the point marked "B" on the plan. At the point marked "C" on the plan no trout were found and ten different species of fish were collected. This condition is rarely, if ever, found in trout streams. Trout have been reported at this point, but the waters are obviously marginal for them.

Trout were also reported to have been stocked in the pond on the main stream at Norwood, but satisfactory growth and reproduction can hardly be expected from these waters. The lower part of the Ouse River is good habitat for largemouth bass and fair for smallmouth bass, although carp are a problem here.

Rock bass and associated species are common in the Indian River and no attempt should be made to introduce trout into these waters. Muskellunge and bass are reported from the lower part of this stream, but carp are said to have damaged the habitat. The walleye (pickerel) is an important species in the Otonabee above Peterborough, and many are caught above the dam within the city limits. Young's Point, at the extreme edge of the region, is well known to provide a spectacular walleye population and excellent fishing on the opening day of the season, but the fishing pressure here is so great that the catch per unit effort soon diminishes.

It was reported by several of the residents along the course of the Otonabee below Peterborough that fishing success has gradually declined in this part of the river, and that it was particularly poor in 1962. The cause is not definitely known, but it may well be attributed to any one or all of the following conditions. The river is in general almost clear above Peterborough, but it is turbid

below the city virtually down to the mouth. This may be partly due to the presence of large numbers of carp in the river below Peterborough. The difficulty may be due to the turbidity alone, to the presence of large quantities of algae in the water, to the lowering of the oxygen concentration in the water, or to the presence of noxious materials in the water from effluents in the city of Peterborough.

2. Pollution

Much concern has been voiced about the extent of scums of algae in the waters of the Kawartha Lakes, east of Lindsay. The cause is not certainly known. It is known that the number of different species of algae in the eastern Great Lakes area runs into the thousands. Only a few of these are likely to cause unpleasant scums. The algae are usually ignored by most people when they are not causing a nuisance. The town of Lindsay has been blamed for the over-fertilization of Sturgeon Lake and the other lakes in the chain, including Clear Lake and Stony Lake. This problem is to be dealt with by the installation of two large lagoons at Lindsay, in which bacteria will act on the wastes, giving a much improved effluent. However, the effects of detergents which involve long-term increases in the phosphate and nitrate content of water will not be much changed by these measures. It must also be remembered that there is a summer population on the Kawartha Lakes which far exceeds that of Lindsay. Many of the cottages and fishing camps have effluents which include sewage and detergents. These eventually find their way into the lakes. The improvements at Lindsay are a great step in the right direction, but it remains to be seen whether the detergents from Lindsay and the detergents and other waste from the cottages and camps will not continue to over-fertilize the lakes.

It should also be noted that scums of algae are present at intervals in lakes which have no towns on them.

Since the two major outlets of the central Kawartha Lakes are firstly the outlet via Clear Lake, Katchiwano Lake and the Otonabee River, and secondly the outlet from Stony Lake to the Indian River, the Conservation Authority cannot ignore the conditions caused by pollution in these lakes.

Whenever any extensive pollution is suspected in the Otonabee Region, the matter should be brought immediately to the attention of the Ontario Water Resources Commission in Toronto, which has ample powers to take appropriate action.

In addition to the types of pollution already mentioned, it should also be noted that no person or corporate body may discharge into a flowing stream or into public water any herbicide or pesticide without first obtaining a permit from the Ontario Water Resources Commission. The provisions are strict and the penalties heavy.

CHAPTER 3

WETLANDS

The multiple use of wetlands for wildlife and other purposes is well known. It was decided to concentrate work on those larger areas of wetlands which might provide at least fair cover or food for migratory waterfowl and preferably breeding sites also. A large number of what appeared to be wetlands from local reports, from the land use and forestry surveys and from examination of air photos, were visited. More than 40 of these areas were mapped in the field and, of these, 17 were selected for detailed mapping. These 17 maps which show the vegetation in considerable detail are available for the Authority's use.

The management of wetlands is becoming an important function of the Fish and Wildlife Branch of the Department. Several are managed so that much more orderly and successful shooting is carried on than occurred in the past. It might therefore be in the public interest for a Conservation Authority to acquire one or more areas and to make arrangements with the Department of Lands and Forests that the Department manage the shooting in them. This is particularly appropriate where a wetland adjoins or is part of a section of the proposed Authority Forest. The major wetlands useful for the purposes described above are shown and numbered on the accompanying plan. Many stretches of the Otonabee River are, of course, used by wildfowl, and much of the edge of the river provides satisfactory habitat for wildfowl. However, so far as breeding habitat is concerned, there is a large and growing adverse effect on the use by wildfowl from the increasing use of the river by watercraft. The same is true of the Indian River which is frequently navigated up to Keene and occasionally beyond this point. There are numerous areas in Dummer Township

WETLANDS SUITABLE FOR WILDFOWL

LEGEND

WETLANDS

SCALE MILES

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which have wet soils but there are few potholes and most of these wetlands dry up in summer. Such areas are normally filled with dense stands of poplar, willow scrub and Dogwood and they lack true aquatic vegetation and are not important for wildfowl.

A brief description of each of the major areas shown on the map follows, the areas being numbered as on the accompanying plan.

Area No. 1

This is an area of about 30 acres cut off from Little Mud Lake by a causeway. The water is normally from 1 foot to 3 feet deep. The chief vegetation consists of the following:

Typha (Cattail)	- Scattered patches
Carex (Sedge)	- Scattered patches
Zizania (Wild Rice)	- Common
Potamogeton pectinatus (Sago Pondweed)	- Common in the Western section
Potamogeton natans (Floating Pondweed)	- Common in the Northern section

The bottom is muck.

Wildfowl potential:- For breeding birds - Poor
For migratory birds - Fair

Area No. 2

This is an area of about 70 acres of marsh with a stream meandering through it. The stream is not navigable except by canoe in a few places. Most of the area is covered with sedges growing in six inches to one foot of muck lying over a stony bottom. Amongst the sedges there is much scrub willow and dogwood. The open stretches of water have patches of aquatic plants as follows:- Lemna (Duckweed), Potamogeton pectinatus, Ceratophyllum (Hornwort) and Nuphar (Yellow Water Lily). If the water level were raised this might be an excellent wildfowl habitat but in its present condition it must be classed as poor in wildfowl potential both for breeding and migratory birds. Cattails are absent from this area.

Area No. 3

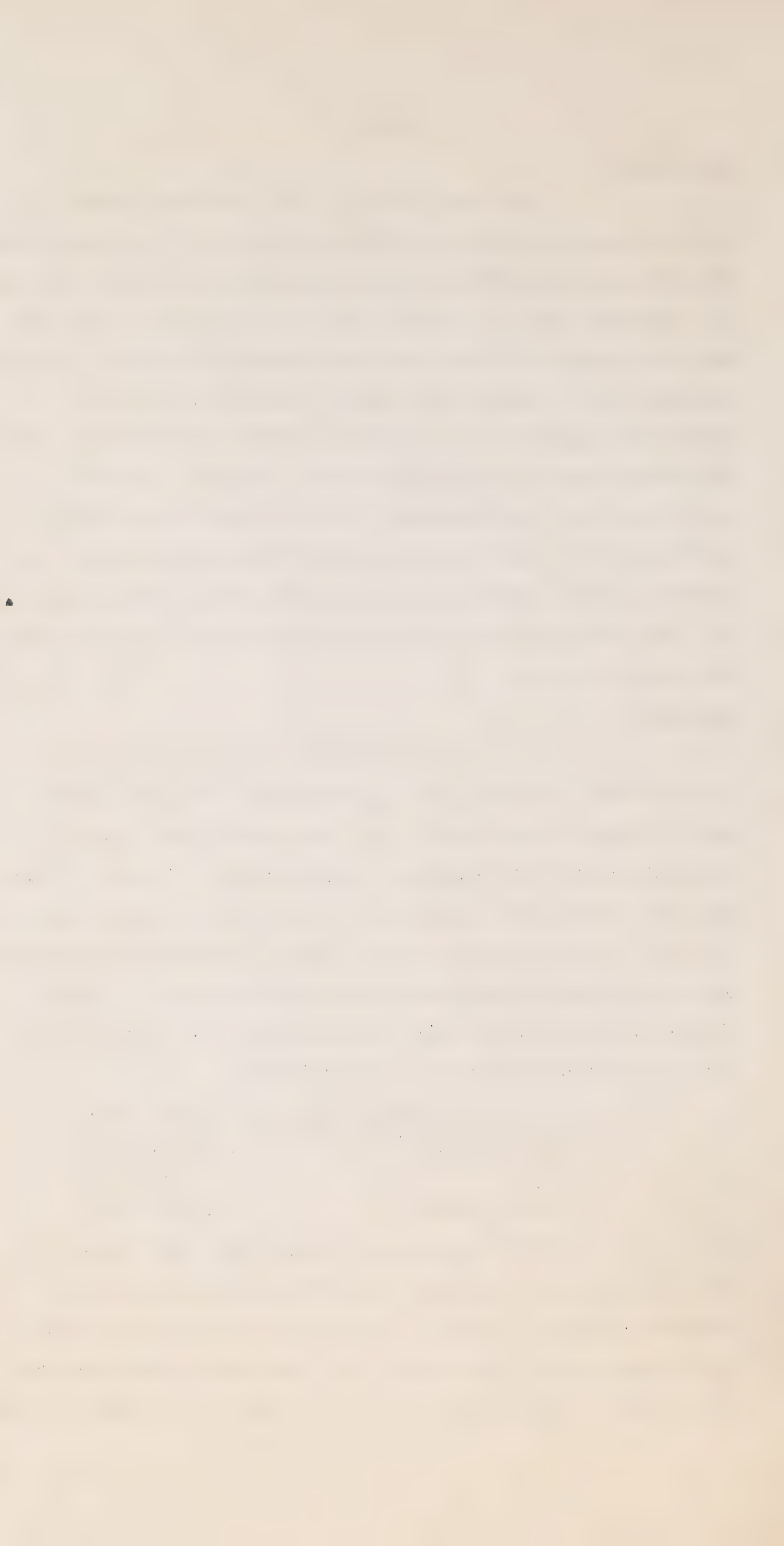
This area of 200 to 300 acres was mapped in 1960 as excellent wildfowl habitat particularly for Wood Ducks. Water, four to eight feet deep, was impounded by a beaver dam and an abandoned railroad and the area was virtually a lake with many dead trees in it and scattered aquatic vegetation, chiefly a grassy form of Carex, and Lemna. However, in 1962 the beaver had apparently been removed and the dam taken out. The open water area had been reduced to a few acres along the stream course. The remainder of the area was covered with tall sedges. If it is found possible to replace the dam, an extremely simple operation as it is only about 15 feet wide, the area would rapidly become an excellent area for waterfowl. The bottom is muck.

Area No. 4

The so-called "Buckley Lake" was originally a bed of marl extending over approximately 850 acres with a small forested island in it. Marl was removed to a depth of about six feet in 10 channels covering about 175 acres. These channels filled with water, most of which is too deep (considering the low fertility of the marl) for aquatic vegetation. Scattered Floating Pondweed occurs in a few areas in these channels. On the artificial ridges between the channels the chief vegetation consists of the following:-

Myrica gale (Sweet Gale)	- 40 per cent
Betula pumila (Swamp Birch)	- 20 per cent
Salix (willow)	- 10 per cent
Typha	- 5 per cent
Carex	- 5 per cent
Miscellaneous	- 20 per cent

When examined in October 1960, the whole area was dry except the excavated channels. Only one duck, a Mallard, was seen. At that time some 20 per cent of the dry bottom was bare of vegetation. The remaining 80 per cent was filled with a dense stand of Scirpus validus (Soft-stem Bulrush).





The former condition of Buckley Lake, showing much of the marl bottom dried out. The lake is now controlled at a level about 2 feet higher than that shown. This area is virtually surrounded by lands recommended for development as Authority Forest.



Willow scrub in permanent standing water. Such areas provide good cover but little food for waterfowl.



A section of the Indian River, which has excellent food and cover for waterfowl, but which has the serious drawback of intensive use by boats. The light areas in the foreground are Duckweed.

In June, 1962, the channels looked much as before, but the lake had an average depth of six inches of water. The pH of the water was between 8.4 and 9.0, indicating considerably alkaline water. In two traverses of the lake five ducks were put up, three Black Ducks and two Mallards. Two beaver were observed. The wildfowl potential was classified as fair for breeding, good for migratory waterfowl.

The property has recently been sold to a group of 16 persons and a dam has been built across the outlet of the lake. This dam will keep the lake continuously from one to two feet deep, or its depth can be fluctuated to improve the growth of wildfowl food and cover plants. It should be possible to improve the potential of this lake very greatly for both breeding and migratory wildfowl. The most important requirement for management of this marsh is that there should be a refuge or resting area where ducks are completely unmolested and that this should be in one of the most attractive parts of the marsh. Already imported Sago Pondweed, Smartweed and Muskgrass have been planted in the lake. Actually all of these species are available in large quantities in nearby areas and it should not be necessary to import them.

It should be noted that the lands bordering Buckley Lake were recommended for tree planting and for management as part of the Authority Forest.

Area No. 5

This is an area of about 120 acres on the east shore of Chemung Lake at its southern end. There is a wide stand of Cattails on the edge of the lake. Farther out in the lake, Sago Pondweed is common and Bladderwort is dense. The marsh area on the southern shore of the bay can be classed as excellent territory for migratory waterfowl.

Cottages are built on the northern shore of the bay and the outboard motorboats at these cottages probably have some effect on nesting waterfowl. However, due to the many stumps and fallen trees, boats are unable to go within 150 yards of the southern shore and cannot enter the eastern end of the bay.

Area No. 6

This area of only 70 acres is included because it is surrounded by land recommended for Authority Forest. The area is chiefly scrub willow with beaver and muskrat houses, and with Sago Pondweed in the main channel. Thirty-one ducks were put up in this area on June 8, 1962. The area is posted along the bank of Squirrel Creek.

Area No. 7

This area is a backwater of the Otonabee River, and has a dense stand of Cattail and large amounts of Sago Pondweed and Water Lilies. *Myriophyllum* (Water Milfoil) is common. It provides fair territory for both breeding and migratory waterfowl. The area lies along the edge of a recommended Conservation Area.

Area No. 8

This is an area of about 300 acres, which formerly may have been part of the course of the Otonabee River. There is an excellent mixture of willow, Cattail, and open channels, making good nesting grounds. The best section of the marsh is not used by boats at all. Algae cover much of the water surface. Duckweed and Pondweeds are common. There are cottages along the west side of these wetlands near the Otonabee River, but in most of the marsh there is no disturbance from boats. The area as a whole provides excellent breeding and migratory waterfowl potential.

Areas No. 9, 10, 11, 12, 13 and 14

These areas comprise the well-known Rice Lake marshes. They all have certain similarities, but there are important differences. Most of the areas include large sections of marsh in which the water level fluctuates according to the level of Rice Lake both from seasonal changes and from the effects of strong winds on the lake, blowing towards the marshes.

The watershed was examined in early summer, so no estimate is available of the use made of these wetlands by wildfowl migrating in the fall. The shortage of time available also made it impossible to make a count of nests in these wetlands. The study was therefore confined to the environment, particularly including food and cover vegetation.

It is difficult to assess the resources of the Rice Lake marshes as a separate entity, because these all depend partly on the presence of the large expanse of water of Rice Lake itself.

There are three series of marshes along the north side of Rice Lake. One of these lies at the mouth of the Otonabee River. The second stretches from the east side of the Hiawatha Indian Reserve for several miles eastward to the mouth of the Indian River. The third series begins three miles further east and includes all the eastern marshes near and at the mouth of the Ouse River. The lake is shallow off all these marshes and there is a band of exceedingly valuable food plants in the lake itself off these marshes. They are separated by long stretches of deeper water where high drumlins edge the shore.

It has not yet been shown conclusively whether the wildfowl taken in these marshes early in the season are those that are bred in the marshes or are early migrants from farther north. In any case there is no doubt that later on



LEGEND



DENSITY OF VEGETATION

1 Sparse.
2 Common.
3 Very common.
4 Abundant or Dominant.

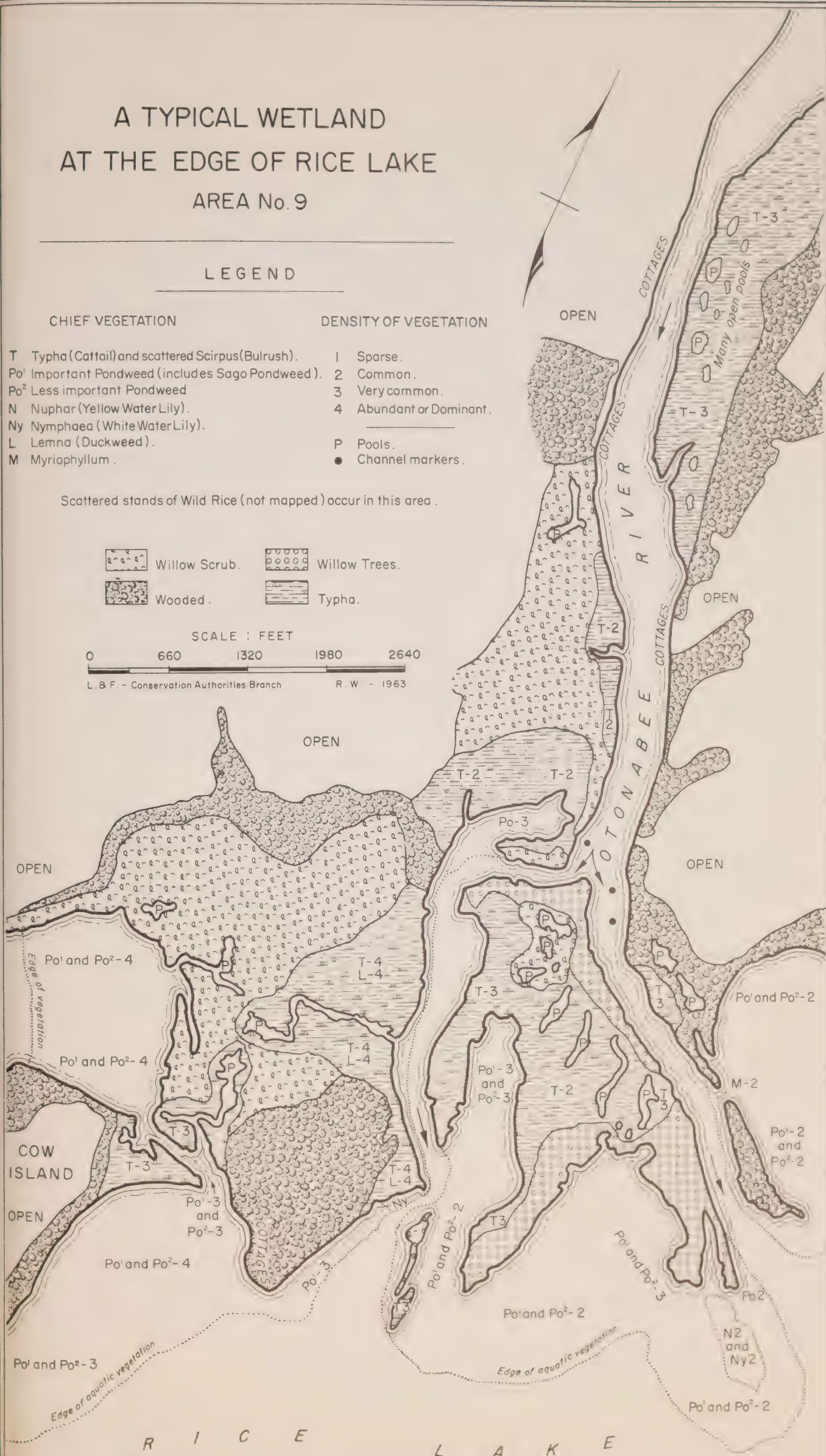
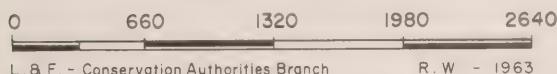
P Pools.
● Channel markers.

Scattered stands of Wild Rice (not mapped) occur in this area.

 Willow Scrub.
  Willow Trees.

 Wooded.
  Typha.

SCALE : FEET



in the season these marshes constitute one of the more important waterfowl grounds in Southern Ontario. It is difficult to define the exact limits of the Authority boundary in this area, but the best fall feeding grounds lie outside the Authority boundary in the shallows of the lake itself. Breeding territory lies chiefly in the land in which the Authority has an interest. Much of the land is now posted against hunting and trespass.

The Trent Canal system (here the Otonabee River) passes along the eastern side of Area No. 9, and many boats disturb this area in spring and summer. All of these marshes, except No. 13, are much affected by the exceptional fertility of the water of Rice Lake. Areas 9, 10 and 11 all have in places too dense stands of Cattail (Typha) which provides no food except for muskrats. Scattered small dense stands of Cattail are useful for cover but larger dense ones are relatively useless for wildfowl.

Apart from the disturbance to the area by boats, Area No. 9 is an excellent breeding and migratory habitat for wildfowl. The many open pools amongst the Cattails and the abundance of Pondweeds are significant factors.

Area No. 10 is a marsh covering more than 1,000 acres stretching from the eastern part of the Hiawatha Indian Reserve to McGregor Bay. Cattails of moderate density constitute the chief species of inshore vegetation, but these are mixed with scrub willow on Harris Island which also has many scattered open pools. There is also much scrub willow on the west side of McGregor Bay. Pondweeds of three main types (Sago Pondweed, Richardson's Pondweed and Floating Pondweed) grow in the shallow water in a wide band stretching for more than 2 miles along the lake shore. McGregor Bay is also well filled with Pondweeds, apart from

two narrow channels. *Myriophyllum* is a common species throughout this marsh. The whole area provides first-class cover and food for wildfowl.

The present status of Wild Rice (*Zizania palustris*) (a great attraction to wildfowl in the fall) in the Rice Lake marshes is of particular interest. There was formerly a dense band of rice from the mouth of the Otonabee River stretching in an almost unbroken line to a point east of the mouth of the Ouse River. The species was also abundant in the Otonabee River itself. It seems that the species became less abundant after the building of the dam at Hastings. The silting of the inshore waters and the abundance of carp may have had some effect on the reproduction of rice. Wild Rice has always been a species which varied in abundance as it is an annual grass growing only from seed. At one time it was difficult for boats to enter the mouth of the Otonabee River because of the dense beds of rice at the mouth.

At the time of the survey (June and July, 1962) it was difficult to be certain of the abundance of the species because most of it had not yet reached the surface of the water. Scattered stands were recognizable in the marshes at the mouth of the Otonabee and off the Indian Reserve, but it was apparently not a common species elsewhere. Because of the season of the year when the survey was made, the distribution of rice was not mapped on the plans showing the vegetation of the marshes.

Area No. 11 includes 630 acres, of which about 500 acres consists of a dense and solid stand of floating Cattail and sedges which however will not safely support a man walking. There is not nearly enough open water in the marsh. It would provide excellent territory for breeding

and migratory waterfowl if many small open water areas could be created in the floating bog, back 100, 200 or 300 yards from the edge of the river. There is one stretch of good breeding territory at the main bend of the Indian River between Rice Lake and Keene. Here there is good interspersion of cover and food plants in open water.

At the time of the survey there was one beaver lodge at the mouth of the river, but no fresh cuttings were present. There is a narrow band of mixed open water and alders between the bottom of the hill west of the marsh and the main stand of vegetation.

Potentially this is a very fine marsh, but work with a cutter or with explosives would greatly improve it. There are several new mechanical cutters on the market, including one which will cut vegetation in a 12-foot strip up to six feet below the water surface, but it is extremely doubtful that such a device would deal with the coarse floating mass of Cattails with matted vegetation three or four inches thick, which is characteristic of this marsh.

It is probable that explosives would have to be used in the marsh. A new explosive, Amex II, is recommended for trial. This new material, packed in plastic bags weighing 50 lbs. each, consists of a mixture of fuel oil and ammonium nitrate fertilizer. A stick of dynamite is inserted into each bag and activated in the usual manner with an electric blasting cap connected to a battery. The cost of using Amex II should lie between 12 cents and 22 cents per cubic yard of material moved. Care should be taken that the blasting does not affect the fish in the river and tests should be made before the material is used extensively. Details of this and other explosives can be obtained from the Explosives Division of Canadian Industries Limited.

Apart from the Indian River itself there are none of the useful channels such as are seen in the Long Point marshes. At the edge of Rice Lake the Cattails end abruptly but in the lake there are large stands of floating and submerged Pondweeds and Myriophyllum. Disturbance by boats in the river and lake is high.

Area No. 12 is an area of about 200 acres of marsh with a small stream flowing through the eastern section. The most general vegetation is scattered scrub willow growing from a muck bottom in water varying in depth from four inches to three feet. There is a maximum depth of six feet in the main channel. There is excellent interspersion of sedges, Cattails, Bulrush, Dogwood and Sweet Gale. The eastern part of the area is interlaced with a network of waterways about 16 feet wide and up to two feet deep. The western part of the area has many small open pools. Pondweeds, Coonwort and Bladderwort are all abundant.

This area may be summarized as providing excellent territory both for breeding and migratory waterfowl. There is an additional area of about 60 acres farther up the stream, west of Birdsalls Station. This is a long narrow strip of marsh created by a dam at the south end. The dam had a major leak in 1962 and the water level was down, leaving 18 inches of muck over a stony bottom. Minor repairs to the dam would much improve the marsh. Most of the surrounding lands are wooded.

Area No. 13 is a small marsh of 40 acres cut off from Rice Lake by a high sand bar. Most of the area is covered with a dense stand of alder and willow standing in water about six inches deep. There are occasional small patches of cedar. There is only one small open water area. At the time of survey it was covered with Duckweed. The area provides limited fair breeding territory for Wood Ducks and only poor territory for most species of migratory waterfowl.



Part of the Cavan Bog, wet in spring, dry in summer, with no ground vegetation. This area is of little use to game species, except as emergency cover.



Part of Wetland No. 14 at the mouth of the Ouse River. In the background there is a dense stand of Cattail and Sedges. The area in the foreground would be classified on the survey maps as T-2, N-2, indicating a moderate density of Cattail and Waterlily. A few young Wild Rice shoots can be seen.



At left, a backwater of the Otonabee River which provides excellent waterfowl habitat. At right, the Otonabee River which is disturbed by many boats. This area is near Bensfort bridge.

The general dispersion of cover and food of Area No. 14 is almost identical with that of marsh No. 10. There are numerous scattered open pools amongst mixed Cattails, alder and Dogwood. There may be some interference from boats in the main channel of the Ouse River, but there are many additional pools and indentations in the Cattails in the long marsh which parallels the shore for a mile east of the Ouse River. The band of Pondweed along this area is narrower than in the western marshes, but as a whole this area must also be considered as excellent habitat for both breeding and migratory waterfowl.

Area No. 15

This is a long narrow section of the West Ouse River and the wetlands which line its banks. The depth of water varies from six inches to six feet, the average depth being one foot. The bottom is muck. There is no disturbance by boats. Cattails are moderately dense along the upper part of the river together with scrub willows. The distinguishing feature of this wetland is the profusion of useful aquatic plants, chiefly Sago Pondweed and Coonwort. The water is impounded by a dam alongside a sawmill and the level of the water is controlled by the owner of the property, Mr. Bruce Warr. This area has been stocked with Mallards by the owner. Additional duck foods have been planted, but with little success. This area (75 acres) can, however, be classed as excellent for both breeding and migratory waterfowl. It is not open for hunting.

Area No. 16

This area includes Rotten Lake and the marshy area which surrounds it. This is a relatively sterile area with scattered patches of Water-Lily, Coonwort and Soft-stemmed

Bulrush. The lake is uniformly shallow with an average depth of 1.5 feet of water over a bottom of muck and marl. The lake is surrounded by a narrow band of Cattail and dense Bulrush. The lake is at present impounded by a beaver dam. Three beaver lodges were present in 1962. There is no disturbance by boats. The area involved, about 300 acres, can only be classed as fair territory for breeding and migratory waterfowl.

CHAPTER 4

IMPROVING THE LAND FOR WILDLIFE

There is a very great variation in the soils, topography and vegetation of this region and the requirements of food and cover vary greatly for different species of wildlife. Landowners also differ in what species of wildlife they wish to see on their land. The only data available on the percentage of farmers who hunt on or close to their own farms are averaged from a survey of 380 farm households living in a large area stretching from Essex County in the west to Durham and Northumberland Counties in the east.* On the basis of these statistics 56 per cent of farm families hunted in 1957. Of these 76 per cent hunted only within 15 miles of home. Eighteen per cent of farmers consulted in the survey posted their lands against trespass. The percentage of farmers posting their land against trespass in the Otonabee Region is probably much smaller because relatively few farmers in this region are close to large urban areas. It is probably a safe assumption that about 50 per cent of the landowners in this region are not interested in increasing the number and kinds of game species on their property. This, of course, still leaves a very large number who are interested. There is also a steadily increasing interest in natural history in Ontario and particularly in the area centred in Peterborough, which has a very active naturalist club. The following remarks, therefore, apply to all those whose lands include steeply sloping or swampy land, and to all who wish to improve the carrying capacity of the land for wildlife.

* Farm Survey of Fishing and Hunting in Southern Ontario, McCrimmon, H.R., published by the Toronto Anglers and Hunters Association, 1958.

1. Important Species

The following game and fur species are considered most likely to prosper in the region under good management:-

Ruffed Grouse	Muskrat
Woodcock	Fox
Black Duck	European Hare
Mallard	Mink
Bluewinged Teal	Deer
Wood Duck	Beaver
Other migrating ducks in season	Cottontail

The above list is virtually the same list as that contained in the "Report on Wildlife Survey in Durham County", by W.W.H. Gunn, A.H. Lawrie, A.T. Cringan and R.G. Young, published by the Department in 1947. To this original list the Mallard, which has greatly increased in numbers in Southern Ontario in recent years, has been added. The beaver, it should be noted, is now so common that it has posed serious problems in this region and in many other parts of Ontario. Deer have also increased since the above-named report was published. The Ring-necked Pheasant is omitted from this list because the mean annual snowfall is well over 70 inches at Peterborough and the climate undoubtedly creates marginal conditions for this species throughout the region.

2. Woodlands

About 50 per cent of the remaining woodlands in the watershed consist of farm woodlots. The elimination of grazing in these woodlots would be the most useful single measure in improving the wildlife environment.

In young plantations on grassy land the entire planted area is valuable for wildlife. But large blocks of coniferous trees will, at least after about the twelfth year from planting, have little or no undergrowth and will, apart from edges or fire-breaks in them, be relatively sterile as

far as upland game and most forms of wildlife are concerned. The chief improvements to be expected will, therefore, come from good management of the farm woodlot. In mixed woodlands selective cutting is both sound forestry practice and good planning for wildlife. Landowners who have woodlots in which the crown canopy has closed over considerable areas and who wish to produce a proper environment for wildlife, will find that release cuttings, slashings to stimulate sprout growth, thinnings and felling timber for sale will improve rather than reduce the carrying capacity for wildlife. Construction of brush piles from cuttings is recommended where cottontail rabbits are desired, two or three such brush piles per acre being the normal spacing.

3. Cultivation Practices

All good farming practices which make a more luxuriant vegetation will improve the farm environment for wildlife. A few special practices will give more specific benefits. Strip-cropping is of particular value, since by this means no extensive area is denuded of cover at one time by harvesting. Grassed waterways provide travel lanes and nesting cover for wildlife. Cover crops such as Hairy Vetch provide a habitat and food for wildlife in areas that would otherwise be barren during the winter months. The elimination of brushy fencerows is now becoming more common in the Otonabee Region. Those who are interested in wildlife improvement will find that the inclusion of a few field boundary hedges on the farm will moderate the effect of winds on crops, serve as travel lanes and cover for wildlife and harbour large numbers of song birds which may help to control insect pests. Inevitably the presence of boundary hedges on a farm tends to encourage the growth of weeds. This is the price that must be paid for improved wildlife conditions in farmland.

The following are a few species of plants which are of particular value as food or cover for wildlife:-

Rosa multiflora - this is an excellent hedge-forming shrub. It has a tendency in Southern Ontario to die back in winter, but rapidly forms a dense hedge which is reported to be proof against cattle and hogs. It provides both cover and food and does not exhaust the nearby cultivated ground. The hardiness of some varieties is questionable. It might therefore be wise to propagate this species by vegetative means from individual plants that have already been planted and found to be hardy in the Otonabee Region. Information on this species can probably be obtained from the Provincial Forest nursery at Orono.

Hairy Vetch - this species can be grown on the poor sandy soils of the moraine in Cavan and Dummer Townships, although it will grow better on good soils. This species over-winters well. Cottontails and the European hare use it for food and cover. The seeds are eaten by a great many of the ground-feeding birds.

Corn - A few rows of uncut corn standing in a field or garden will provide excellent cover and a continual supply of food for the larger birds. Cracked corn is useful for smaller birds. Corn left near streams will almost certainly be removed and eaten by raccoons.

Buckwheat - this common crop plant is chiefly grown for its abundant seed which is mixed in with other seeds in feed mixtures. The seeds have a high fat content. The rest of the plant is commonly ploughed under, particularly to increase the soil nitrogen. Much of the seed drops off in the stubble, and buckwheat stubble is a favorite feeding ground for almost all birds.

Highbush Cranberry - this shrub is strongly recommended and is a native species in this area.

European Millet - the abundance of seeds of this species attracts vast numbers of birds. It is grown commercially for bird seed.

Wild Grape - provides excellent wildlife food and cover, but it forms such a dense tangle over fences and young trees that it should only be planted where it can be carefully watched and controlled.

The Highbush Cranberry and Wild Grape can usually be found growing on some part of every farm.

There are many other plants that could be recommended for use as cover, food or nesting sites. Some of these are also useful for erosion control. Experiments are being carried out with a large number of shrubs in the Metropolitan Toronto and Region Conservation Authority's nursery and in experimental plots associated with this nursery. Silky Dogwood (*Cornus Amomum*) appears to be one of the most promising of these.

4. Water

The importance of water to wildlife is often forgotten. Many farms have at least one low spot where a small amount of work with a scoop will create a dam and a pond to provide nesting and feeding sites for water and marsh birds. If possible, ponds for wildlife should be separate from those intended for cattle or for fish. New water areas are usually very rapidly invaded by aquatic plants, but additional species may have to be introduced. No extensive duck food studies have been made in Southern Ontario. Wild Rice may be introduced but it cannot be considered as certain to succeed. The seed must be kept wet from the time it is harvested until it is sown (or broadcast) on the water surface. The idea has long been current, and fostered by many sportsmen's organizations, that the growing of Wild Rice is the answer to the problem of how to attract

ducks to any area. It is a very important species where migratory wildfowl are wanted but it does not provide good cover or nesting sites.

The following species which may be easily obtained are recommended as certain to be valuable duck foods. If none of them occur in ponds or shallows with good cover for ducks, they can be introduced. All of them are hardy in Southern Ontario.

Sago Pondweed	<u>Potamogeton pectinatus L.</u>
Red-head Pondweed	<u>Potamogeton Richardsonii</u> <u>(Ar. Benn.) Rydb.</u>
Wild Millet	<u>Echinochloa crusgalli (L)</u> <u>Beauv.</u>
Japanese Millet	<u>Echinochloa frumentacea</u> <u>(Roxb.) Link</u>
Wild Celery	<u>Vallisneria americana Michx.</u>
Knotweed	<u>Polygonum pensylvanicum L.</u>
Water Smartweed	<u>Polygonum coccineum Muhl.</u>
Three-square	<u>Scirpus americanus Pers.</u>
Great Bulrush	<u>Scirpus validus Vahl.,</u> <u>var. creber Fern</u>
Duckweed	<u>Spirodela sp. and Lemna sp.</u>

Those who are interested in farm ponds for wildlife will find very useful details of the various types of ponds and methods for constructing them in a booklet "Farm Ponds", published by the Provincial Department of Agriculture. This book is at the moment out of print but may be consulted at many reference libraries, and at the offices of many Agricultural Representatives. Farm ponds differ from those intended for wildlife in that care should be taken to prevent the growth of aquatic vegetation in a farm pond intended only for watering stock or fire protection purposes. Otherwise the construction and details of ponds for wildlife should follow one of the types described in the bulletin.

Algae in ponds are often only present for a short time and will disappear in a month or so. From experiments conducted by the Metropolitan Toronto and Region Conservation Authority it is recommended that the safest method of getting rid of algae is to treat the pond with a

concentration of one part per million of copper sulphate which should be distributed uniformly over the pond. If there is no sign of disintegration or change in colour of the algae, then a second dosage of one part per million should be given in three or four days, and if this is not successful a third dosage should be given of the same concentration three or four days later. Under no circumstances should three parts per million of copper sulphate be applied in a single application. There are several chemical compounds on the market which are recommended by the makers as suitable for destroying particular species of algae. Aqualin is no longer available for sale as it does not meet the safety standards of the Ontario Water Resources Commission. If the vegetation is chiefly the algae *Cladophora*, the chemical compound known as Hydrothol, which can best be sprayed from the air either as a liquid or as granules, is successful. However the rate of current is extremely important in this matter since the chemical should be in contact with the weeds for at least an hour.

The larger aquatic vegetation, if too abundant, cannot be removed except by cutting (a heavy chain is useful), by draining the pond, or by the use of 2-4-D for emergent vegetation or by poisonous compounds such as sodium arsenite for submerged plants. In any case if there is any plan to use a chemical herbicide it would be absolutely necessary to receive a permit from the Ontario Water Resources Commission, if the treated water flows into any other privately owned or public waters.

If there is doubt as to what the species of weeds are and how they may be controlled, a fair sample of the weeds should be placed in a quart sealer, which contains a 5 per cent solution of Formaldehyde, and the sealer should be sent to the Ontario Water Resources Commission, Toronto. The Ontario Water Resources Commission can provide information as to where Hydrothol or other controlling products can be obtained in Ontario.

CHAPTER 5

FORMER AND PRESENT SPECIES

1. Former Species

There are a few species which probably were found in the Otonabee Region at the time of settlement but which apparently no longer occur in it. These would include the wolverine, cougar, Canada lynx and the wapiti or American elk. The bobcat or bay lynx may still occur rarely in the region. It certainly was present in the early days of settlement. One weighing 25 lbs. was reported in the Orono News in 1926 as having been killed by Colonel Myles near Orono, south of the Otonabee Region.

It is hardly necessary to mention the disappearance of the passenger pigeon from the region. This now extinct species was a migrant. Its vast flocks amazed the early settlers. Wild pigeons were reported "in myriads" in Durham County between 1856 and 1863.* They were present in immense numbers in 1858, according to F.M. Atwood, a descendant of Mrs. C.P. Traill, who lived near the site of the present village of Lakefield. The species nested around Lakefield from 1866 to 1876 in beech and maple woods, according to J.F. Lillicrop of Lakefield. It is now generally thought that the species was subject to great fluctuations in numbers long before Southern Ontario was settled. Its final decline was very rapid, since there were great numbers in 1860 and hardly any remained after 1880. The last reported in the region were 14 shot one mile east of Lakefield in 1881. The extinction of this species probably came as much from the clearing of the land as from intensive market shooting.†

* Squair, John. "The Townships of Darlington and Clarke" University of Toronto Press, 1927.

† References to the passenger pigeon are taken from Mitchell, Margaret H. "The Passenger Pigeon in Ontario", Royal Ontario Museum of Zoology, Toronto, 1935.

The status of the moose in the region is interesting. At the time of settlement moose ranged down approximately to the edge of the Precambrian Shield and may well have been present in the region south of Young's Point. Later there was a northward retraction of their range in this area and they were no longer found anywhere near the Otonabee Region. Recently, perhaps because of a closed season on moose, which lasted several years in Ontario, moose have become much more numerous and they have several times been reported within 25 miles of Peterborough.

2. Present Species

There is a rapidly growing interest in natural history in Ontario. In the Peterborough area there is a long record of activity in this direction. The marshes on the north shore of Rice Lake are of exceptional interest because of the great variety of migrating waterfowl and shore birds. The relatively wild conditions in the northern part of the region attract many people to this area. Lists are therefore included here of all the species of mammals and birds that are likely to be encountered in the region.

(a) Mammals

The following list of mammals includes a few which have not been observed or collected in the region but which are almost certainly present. The arrangement and names follow those in the "Provisional Check-List of the Mammals of Ontario" by S.C. Downing.* The commonest mammals in the region are the meadow mouse and the white-footed mouse.

Cinereous Shrew	The common shrew of the region.
Smoky Shrew	Occurs in the northern part of the region.
Water Shrew	Probably occurs in the northern streams.
Pigmy Shrew	May occur anywhere in the region.
Mole Shrew	A very common species.

* Misc. Publication No. 3, Royal Ontario Museum of Zoology, Toronto, 1948.

Hairy-tailed Mole	May be present.
Star-nosed Mole	A common species.
Little Brown Bat	The common small bat of the region.
Long-eared Brown Bat	May be present.
Least Brown Bat	A rare species which may hibernate in this area.
Silver-haired Bat	Probably common.
Pipistrelle	A rare species which may hibernate in this area.
Big Brown Bat	The common large bat of the region.
Red Bat	May be seen in migration, rare at other times.
Hoary Bat	May be seen in migration, rare at other times.
European Hare	Introduced and now common in the farming lands.
Varying Hare	A cyclic species common in northern forests.
Cottontail	A common species in woodlots, gardens and fencerows.
Black or Grey Squirrel	Both colours may appear in the same litter. The species is common in hardwood areas.
Red Squirrel	Common in coniferous areas.
Groundhog	Very common in farm lands.
Eastern Chipmunk	Common in woodlands.
Eastern Flying Squirrel	Probably present in the southern part of the region.
Northern Flying Squirrel	May occur in the northern part of the region.
Beaver	Abundant in suitable territory in 1962.
Deer Mouse	The short-tailed form of this species is common.
White-footed Mouse	Common in wooded areas.
Bog Lemming	Possibly occurs in the Cavan Bog or in the northern part of the region.
Muskrat	Very common in marshy areas.
Meadow Mouse	Common with greatly fluctuating populations.
House Rat	Introduced, commensal with man.
House Mouse	Introduced, commensal with man.
Meadow Jumping Mouse	Common but seldom seen.
Woodland Jumping Mouse	Occurs in the northern part of the region.
Porcupine	Common in woodlands in the northern part of the region.
Brush Wolf	This small wolf reached Eastern Ontario about 1920. It is reported from the northern part of the region.
Red Fox	Formerly common, now uncommon.
Raccoon	Common near streams.
Ermine	Probably occurs throughout the region.
Long-tailed Weasel	Probably occurs throughout the region.
Mink	Of general occurrence along the streams and rocky lake shores.
Skunk	Common and a valuable check on many insect pests.
White-tailed Deer	Occurs throughout the region.
Moose	The species has been recently reported from the northern edge of the region.

(b) Birds

The following list includes only those birds which have definitely been reported from the region. Most of the species were observed by one or more members of the survey party, but the list as a whole is based on records made by J.L. McKeever and other members of the Peterborough Nature Club. The arrangement and names in the list are from the A.O.U. Check-List (5th Edition, 1957).

Common Loon	American Coot
Red-throated Loon	Semipalmated Plover
Red-necked Grebe	Killdeer
Horned Grebe	Black-bellied Plover
Pied-billed Grebe	American Woodcock
Great Blue Heron	Common Snipe
Green Heron	Spotted Sandpiper
Black-crowned Night Heron	Solitary Sandpiper
Least Bittern	Greater Yellowlegs
American Bittern	Lesser Yellowlegs
Whistling Swan	Least Sandpiper
Canada Goose	Semipalmated Sandpiper
Mallard	Herring Gull
Black Duck	Ring-billed Gull
Gadwall	Bonaparte's Gull
Pintail	Forster's Tern
Blue-winged Teal	Common Tern
Shoveler	Caspian Tern
Wood Duck	Black Tern
Redhead	Mourning Dove
Ring-necked Duck	Yellow-billed Cuckoo
Canvasback	Black-billed Cuckoo
Greater Scaup	Screech Owl
Lesser Scaup	Great Horned Owl
Common Goldeneye	Barred Owl
Bufflehead	Saw-whet Owl
Oldsquaw	Whip-poor-will
Hooded Merganser	Common Nighthawk
Common Merganser	Chimney Swift
Red-breasted Merganser	Ruby-throated Hummingbird
Turkey Vulture	Belted Kingfisher
Goshawk	Yellow-shafted Flicker
Sharp-shinned Hawk	Pileated Woodpecker
Cooper's Hawk	Red-headed Woodpecker
Red-tailed Hawk	Yellow-bellied Sapsucker
Red-shouldered Hawk	Hairy Woodpecker
Broad-winged Hawk	Downy Woodpecker
Rough-legged Hawk	Black-backed Three-toed Woodpecker
Bald Eagle	Northern Three-toed Woodpecker
Marsh Hawk	Eastern Kingbird
Osprey	Great Crested Flycatcher
Peregrine Falcon	Eastern Phoebe
Pigeon Hawk	Yellow-bellied Flycatcher
Sparrow Hawk	Traill's Flycatcher
Ruffed Grouse	Least Flycatcher
Ring-necked Pheasant	Eastern Wood Pewee
Virginia Rail	Horned Lark
Sora	Tree Swallow
Purple Gallinule	Bank Swallow
Common Gallinule	Rough-winged Swallow

[illegible]

Barn Swallow
Cliff Swallow
Purple Martin
Gray Jay
Blue Jay
Raven
Common Crow
Black-capped Chickadee
Boreal Chickadee
White-breasted Nuthatch
Red-breasted Nuthatch
Brown Creeper
House Wren
Long-billed Marsh Wren
Short-billed Marsh Wren
Catbird
Brown Thrasher
Robin
Wood Thrush
Hermit Thrush
Swainson's Thrush
Gray-cheeked Thrush
Veery
Eastern Bluebird
Golden-crowned Kinglet
Ruby-crowned Kinglet
Water Pipit
Cedar Waxwing
Northern Shrike
Loggerhead Shrike
Starling
Blue-headed Vireo
Yellow-throated Vireo
Red-eyed Vireo
Philadelphia Vireo
Warbling Vireo
Black-and-white Warbler
Blue-winged Warbler
Tennessee Warbler
Orange-crowned Warbler
Nashville Warbler
Parula Warbler
Magnolia Warbler
Cape May Warbler
Black-throated Blue Warbler
Myrtle Warbler
Black-throated Green Warbler
Blackburnian Warbler
Chestnut-sided Warbler
Bay-breasted Warbler
Blackpoll Warbler

Pine Warbler
Prairie Warbler
Palm Warbler
Ovenbird
Northern Waterthrush
Louisiana Waterthrush
Connecticut Warbler
Mourning Warbler
Yellowthroat
Wilson's Warbler
Canada Warbler
American Redstart
House Sparrow
Bobolink
Eastern Meadowlark
Redwinged Blackbird
Baltimore Oriole
Rusty Blackbird
Common Grackle
Brown-headed Cowbird
Scarlet Tanager
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Evening Grosbeak
Purple Finch
Pine Grosbeak
Hoary Redpoll
Common Redpoll
Pine Siskin
American Goldfinch
Red Crossbill
White-winged Crossbill
Rufous-sided Towhee
Savannah Sparrow
Grasshopper Sparrow
Henslow's Sparrow
Vesper Sparrow
Slate-colored Junco
Oregon Junco
Tree Sparrow
Chipping Sparrow
Field Sparrow
Harris' Sparrow
White-crowned Sparrow
White-throated Sparrow
Fox Sparrow
Lincoln's Sparrow
Swamp Sparrow
Song Sparrow
Snow Bunting

RECREATION

CHAPTER 1
INTRODUCTION

1. Recreation Planning in Southern Ontario

It is a paradox of our urban and industrial expansion that, on the one hand, it takes place at the cost of open space surrounding urban areas yet, on the other hand, it also increases the demand for easily accessible open space to satisfy the recreational needs of the ever-expanding, ever more crowded urban populace. This demand is superimposed on the already existing local need for public acquisition of desirable recreation sites which are in danger of being lost to public use. This vicious cycle of increasing demand coupled with increasing scarcity is particularly true of the largest single contiguous zone of urban expansion in the country, which flanks the western half of the shores of Lake Ontario. In the very near future the entire ribbon of this lake shore between Bowmanville and Niagara Falls is bound to become an almost unbroken and very densely populated zone of urban and industrial land. In many parts of this zone, the rates of population growth and urban spread are already three times the respective averages for the country as a whole.

The loss of open space bordering this zone would not have been so extensive if the urban growth had occurred vertically through more intensive use of urban space, as in European or many large American cities. Instead, the preference of the dwellers, industries and commercial establishments has been towards less intensive utilization of land - resulting in the appropriation of more land per user. Rambling homes on individual and large lots, sprawling single-story factories with large open spaces appended to them, and the ever-multiplying single-story shopping plazas with their extensive parking lots all result in a severe

reduction of previously open space. This type of suburban development, of course, was facilitated by many factors, the chief amongst them being higher per capita income, higher purchasing power, the lower cost of what was recently rural land, the rapid growth in the number of individually owned automobiles and a simultaneous expansion and improvement in commuting routes and services between urban centres and their marginal areas.

This expansion has resulted not only in pushing the rural-urban fringe farther and farther away from urban centres, but - what is of greater importance - it has produced significant changes in the recreational habits and needs of the urban dwellers. In the past, when cities and towns were small, short-term outdoor recreation was provided quite adequately by the local parks, which then had a much higher ratio of available land per user. Long-term, i.e., weekend or holiday, outdoor recreation was similarly fairly easily provided by the extensive open countryside surrounding the smaller cities of the past, or by the even more rewarding recreational areas farther north in the region of Muskoka and the Kawartha Lakes.

With the very rapid growth of urban populations the growth of the city parks has not paralleled, either in area or numbers, the growth of the cities. These parks are now far too crowded and totally inadequate for the recreational needs of the citizens. With the intensification of urban use around them they no longer afford any but a nominal relief from the crowded atmosphere of the city. At the same time, the growth of population accompanied by improved wages and salaries over the past quarter of a century has resulted in large-scale private acquisition of land - and crowding - even in the old recreational areas of the lake regions farther north. Here, too, while this appropriation for private recreation space proceeded on a large scale, little provision

was made for allocating or reserving recreational areas for the use of the public in general. To cite an example, the shores of Lake Simcoe, the nearest large-scale summer recreational area for the Ontario urban belt, are almost completely under private ownership. Even where provision was made for public use of recreation areas, as at Wasaga Beach, the density of use is now so high as to defeat the very purpose for which the area was reserved - a quiet enjoyment of natural surroundings and the recreational facilities they offered.

Neither the land nor the waters of Lake Ontario are very suitable for outdoor public recreation on any large scale. The land is too expensive and recreation must compete with other more profitable uses, and the water is usually too cold for swimming even during the warmest part of the summer. As a result, even the lakeshore urban dwellers must seek recreational facilities farther inland.

For those who can afford both money and time to use summer cottages on inland lakes there is no problem; but for those who cannot there is a desperate and mounting need for areas where fishing, swimming, boating, hiking, picnicking and camping facilities will be readily available at low cost.

The best natural lake and river sites have understandably attracted the most intensive private development and would be extremely costly for public acquisition. The best alternative is to develop areas whose recreational potential is considerable but which, owing to their hitherto undeveloped state, have been spared from private appropriation.

2. The Nature of the Stream and Its Watershed

The Otonabee River, on leaving Lake Katchiwano at the end of the Kawartha chain of lakes, flows in a generally southerly direction for a distance of about 32 miles before terminating at Rice Lake. The only serious departure from

the main southerly orientation occurs at the southern stretches where the river is blocked by a series of drumlins and makes a turn eastward of almost 90 degrees for two miles, after which it flows southward into Rice Lake. Beyond the bend the gradient drops and, despite the added waters brought by Squirrel Creek, the channel shows some widening and meandering and the tendency to create swamps in the low-lying area between the bend and Rice Lake. Although the volume of water it carries varies according to the season, the flow in the channel is kept comparatively uniform by regulation of the Trent Canal system. While much of the channel is rather uniform in depth, glacial depositions and unequal erosion of bedrock in the channel have produced a number of rapids and falls. The most pronounced change of level occurs at Whitlows Rapids near Peterborough where in the past the river vessels had to interrupt their journey. Here the spectacular lift lock was completed in 1904. By-pass canals and locks were also constructed to avoid smaller rapids and falls elsewhere on the stream channel.

As the Kawartha Lakes are connected by a series of smaller lakes and streams (e.g., the Severn) to Lake Huron, and as Rice Lake is connected to Lake Ontario by the Trent River, a more or less continuous cross-country water route between Lakes Ontario and Huron has been in use from the earliest days of known settlement. It was in frequent use by the Indians, and later also by missionaries and fur traders. Settlements and depots developed primarily at critical points such as Young's Point, Lakefield and Peterborough where either the river had to be by-passed by short overland portages, or locks and canals had to be constructed for continuous navigation.

Since Rice Lake is nearly midway between the Kawartha Lakes and Lake Ontario, the channel of the Otonabee which joins the Kawarthas and Rice Lake has always been of crucial importance. It is even now the central link of the

entire 240-mile-long Trent "Canal" or waterway system which links Georgian Bay to the Bay of Quinte.

In the past, navigation of the Trent Canal was of commercial importance to Peterborough, Lindsay and the Kawartha region. With improved roads and the lessening of the timber trade in this area, the Trent waterway system became commercially obsolete. The waterway has now rapidly regained importance as an attractive route for pleasure craft. In the Otonabee area the route has a maximum overall boat draft of six feet between Peterborough and Rice Lake. Pleasure craft now ply this section of the route with no interference from commercial vessels.

The Otonabee now occupies only a portion of its old glacial channel. It was formerly a much larger stream, as can be seen by the very wide valley floor it now traverses as, for instance, in the section just north of Peterborough. Even at that time the Otonabee channel formed the main link between the northern chain of lakes and Rice Lake. Earlier, the entire watershed was covered by the glacier in its last advance. The terrain and the landforms in the watershed are undoubtedly moulded by the glacier which after its retreat left not only long finger-like lakes but also the densest drumlin field in the province. The entire watershed is covered by these beautiful rounded or hummocky hills which sometimes merge into each other and are often separated by small lakes and streams. Both the drainage and the drumlins have an almost uniform north-east to south-west orientation, which was the direction of the advance and retreat of the glacier. At present, with the automobile as the main means of travel, the closely strewn drumlins with the roads skirting around or crossing over them are the delight of the unhurried driver. Although the general terrain and type of scenery are similar through much of the watershed, the details of view and prospect are

different at each bend and corner of the snaking roads, and the whole area is very attractive.

3. Climate

If Peterborough were to be taken as representative of the watershed as a whole, then the climate of the region may be described as more moderate than that of the interior areas either to the east or to the west. This is largely due to the proximity of numerous lakes which, even though small, collectively do exercise a moderating influence. The mean monthly temperature for the year is 43°F but for purposes of recreation it is the summer temperatures which are more important. These lie in the range of 65° to 70°. Highest values are reached usually in July and August when day-time temperatures frequently range between 70° and 85°F. Although July and August receive about the same precipitation as other months, the rain occurs mainly in showers of short duration, leaving the bulk of the summer days warm, bright and dry - ideal for outdoor enjoyment. The frost-free period ranges between 120 and 150 days. The spring season arrives a little later than in neighbouring areas to the south but the fall season is long and pleasant. Mean temperatures for September, for instance, are only 6 degrees lower than those of August, and days of 70°F or over are quite frequent throughout the month.

Snowfall, which ranges between 60 and 110 inches, occurs mainly during January and February and snow may persist on the ground almost up to April.

To sum up, climatically the Otonabee Watershed lies in a "transition zone" between the mild section of the Ontario lakeshore to the south and the more severe interior climatic region of Southern Ontario to the north and east.*

* Putnam, D.F., and Chapman, L.J. The Climate of Southern Ontario. Scientific Agriculture Vol. 18, 1938.

Climatically and physically the watershed lends itself mainly to the development of summer recreation facilities.

4. Existing Recreational Facilities

The Otonabee forms the bridge between the small recreation area around Rice Lake in the south and the extensive recreational lands around the Kawartha Lakes in the north, and its own recreational potential is considerable. However, the present extent of public recreational use within the watershed is very small. It is limited mainly to the municipal parks within Peterborough and Lakefield and to the narrow band of Federal property alongside the Trent Canal (mainly the Otonabee River in this section), which has been developed for public recreational sites; but even here no major park has been developed and hardly any provision exists for outdoor recreation beyond the experience of viewing the locks in operation.

The large-scale industrial use of the Otonabee River - it furnishes both water and power to the many industries of Peterborough - has also limited its recreational use.

Special provision has been made for limited recreation along the Otonabee in two places.

About one mile north of Peterborough a municipally supervised park and swimming area has been developed; but even this use is limited by frequent changes of water levels resulting from the competing demands of the local hydro, the local industries and the Trent waterway navigation.

Farther upstream the Public Utilities Commission has developed part of its shore grounds into a small zoo, which occupies the narrow land ribbon between the river and Provincial Highway No. 28, north of Peterborough. The Commission does permit visits to the small zoo and beautifully maintained grounds, but does not permit picnicking and cannot allow swimming in the river, due to the proximity of its dam.

Apart from these two areas public recreational development along the Otonabee is almost non-existent.

5. Criteria for Determining Future Recreation Areas

Since summer is the main season for large-scale outdoor recreation, and since water is an indispensable factor in summer recreation, it is obvious that in planning for recreation full consideration must be given to this limitation. The only recreationally usable waters in the Otonabee Watershed consist of the main streams of the Otonabee, Indian and Ouse Rivers, the shores of Chemung Lake, and a few mill dams on other streams.

Other considerations relevant to the future recreational areas are:

(a) That these should not in any way interfere with the navigation, which is the river's chief function.

(b) That recreation areas should be developed only in those sections of the river or tributaries where the water is not polluted by industrial or urban waste. This limits their location to sections either upstream from urban centres, where the river water is unpolluted, or far enough downstream from the urban areas, where pollution has been diluted to the point where swimming can be safely carried on.

(c) That although such areas should be somewhat isolated or rustic in their surroundings they should also be easily accessible by automobile from the main highways. Unfortunately, even those who imagine that "roughing it" means the true holiday are reluctant to go to areas if they cannot drive to them.

(d) That areas selected should be sufficiently large to accommodate not only present but also future needs of a public hungry for recreation and to provide as many different recreational facilities as possible for the family as a whole.


6. Natural Vegetation

Since the growing season in the Otonabee Watershed is adequate for most crops common to Southern Ontario, and since the soils of the watershed are well drained and fertile, agricultural occupancy is old and fairly complete. This has resulted in the clearance of 83 per cent of the original tree cover, which consisted mainly of maples, beech, basswood, oak and pine on higher lands and better drained slopes, and elm, ash, willows and cedars in low-lying, relatively poorly drained areas. In swampy sections cedars are frequently associated also with balsam fir, black spruce and tamarack. These sections, owing to their relatively poor agricultural potential, are the main areas where one may still expect large tracts of dense vegetation. The hardwoods here, often intermixed with conifers and wet scrub, are mainly second-growth and of poor quality. This is particularly true of the low-lying areas bordering the Otonabee channel and the valleys of some of its other tributary streams, e.g., Jackson Creek and Baxter Creek. Such stands of pure hardwoods as remain are principally elm and poplar in these low wet areas between the drumlins, and hard maple on the higher lands. A mixture of conifers and hardwoods is found along certain sand and clay ridges which are too thinly covered with fertile soil to be suitable for agriculture. There are also almost 10,000 acres of scrub-land.

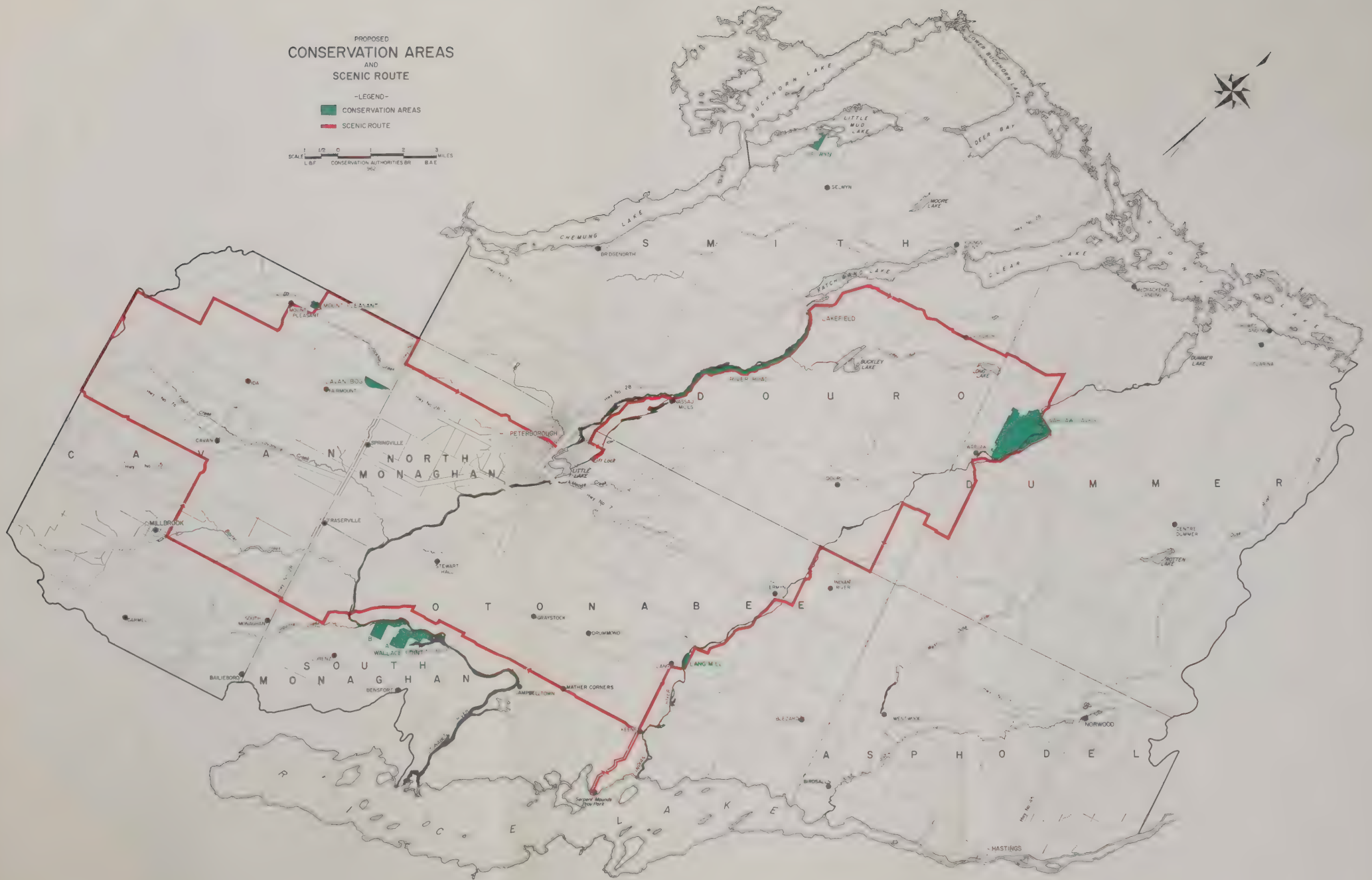
7. Space Relations

From the point of view of recreation and accessibility the Otonabee Watershed has a very central location in Southern Ontario. It is almost halfway between the urban belt along the Ottawa River in the east and the urban region comprising London, Windsor, etc., in the west. The accessibility of Peterborough, the largest centre in the watershed, has been increased by the completion of the link

PROPOSED
CONSERVATION AREAS
AND
SCENIC ROUTE

-LEGEND-
 CONSERVATION AREAS
 SCENIC ROUTE

SCALE
 1 1/2 0 1 2 3 MILES
 L.B.F. CONSERVATION AUTHORITIES BR. 1962



route (Highway No. 115) which connects Highways 101 and 28. The Hamilton-Toronto-Niagara Falls urban complex, with a population of nearly 3 million, lies within 100 miles of the watershed and is tapped by both the major railways and a number of improved or newly developed highways.

Earlier in the report mention was made that the Muskoka Lakes and the Kawartha Lakes region are the major recreational areas that lie closest to the Lake Ontario urban belt. During the past 30 years, the Muskoka area has been more densely appropriated for recreational use, mainly in private properties. The shore properties in the Kawartha Lakes have also been extensively lost through private ownership, mainly summer cottages, but the density of appropriation is less severe here.

In a way, it is most fortunate that the shore properties on the Otonabee River, except in the vicinity of a few populated centres (Young's Point, Lakefield and Peterborough), are still in the main farmland or, at least, undeveloped recreationally. Since provision of public recreational areas through purchase of recreational properties already developed privately will be a most expensive proposition, it is suggested that the Authority should concentrate on acquiring the cheaper but still suitable lands along the Otonabee and Indian Rivers, on two mill ponds, on their tributaries, and on Chemung Lake. This should be done as soon as possible, before these, too, are developed by private owners.

Five major properties, and two with more restricted recreational possibilities, are recommended for early acquisition and development in part into recreational areas for public use. Basically, these properties will be Conservation Areas in the sense that they will not only protect the lands involved from deterioration but also add to their value inasmuch as their natural assets will be improved and put to better use. That part of these areas

could and should be put into large-scale recreational use is all to the good, since this use will make the areas as a whole financially self-supporting and functionally more complete than they are at present. The need for more recreational areas for public use is so clearly evident and pressing in the southernmost belt of Ontario as to render any further emphasis on this matter quite unnecessary.

CHAPTER 2

WARSAW CAVES CONSERVATION AREA

A part of the proposed Warsaw Caves Conservation Area has already been acquired by the Conservation Authority. The proposed area would be a considerable enlargement of the present Authority holdings but the enlargement does not include land of any great economic value.

1. Access

Access to this area is easy, both from Highway No. 28 and from Highway No. 7. It is only 9 miles along a nearly direct county road running east from Lakefield and only 8 miles due north from Highway No. 7 along the county road which separates Douro and Dummer Townships. Both access roads traverse a drumlinized and beautifully wooded countryside which is frequently dotted with fairly old farms.

2. Physical Attributes

The unique behaviour of the Indian River, passing through an underground tunnel 700 feet long and then cutting a curving gorge a third of a mile long through a series of limestone blocks 100 to 150 feet high, must be well known to the Conservation Authority. The hollow dry bowls up to 15 feet in diameter, eroded in the former river bed, add to the attraction of this very beautiful landscape.

The remarkable caves in the limestone on the west side of the river are a great additional attraction. One of these caves lies in the area already acquired. The remainder of them lie in an area of 100 acres on which the Conservation Authority has an option for purchase. However, this area under option does not include the curving gorge which forms the most spectacular scenery in the whole of the eastern part of the watershed. The area should certainly be considered as having a high priority for acquisition.



PROPOSED
WARSAW CAVES
CONSERVATION AREA

—LEGEND—

WOODLAND

AREA ACQUIRED
IN 1962

SCALE 1320 660 0 1320 2640 3960 FEET
L & F CONSERVATION AUTHORITIES BR 1962 B & E

Now that the nucleus of the proposed area has been acquired, the spectacular features will inevitably attract continuously increasing numbers of visitors.

3. Vegetation

Nearly 80 per cent of the land within the proposed area is wooded. In most places the growth is quite dense. Except for a stand of sugar maple which occurs just south of the hydro easement line, the woods contain a considerable variety of tree species. Conifers and aspen grow in close association with elms, the latter being particularly numerous. Closer to the river, cedars and some ash and willow become more common.

There are two small open patches within an otherwise solidly wooded area. Both have grassy floors and could serve as ideal camping sites. The smaller of the two lies adjacent to and north of the hydro easement and is easily accessible if and when the easement strip can be converted into a road passable for cars. The other one lies farther north in the interior just off the hook of the gorge and would be reached by a proposed trail in the woods.

Agriculturally, the land is poor, largely because of a rocky floor, thin soil cover and poor drainage, and it can be acquired quite cheaply.

Campsites can be developed on the open floor just north of the hydro right-of-way and also in the apron of open land skirting the outer edge of the gorge. Both are easily accessible from good country roads. Trails can be developed along the river banks to provide access to the area of the caverns and the gorge bottom. Hiking, picnicking, painting and fishing all can be enjoyed in a relatively small area.

The acquisition of this area by the Conservation Authority would not only preserve it for recreation but also



A spectacular view of part of the proposed enlargement of the Warsaw Caves Conservation Area. The high bluff, from which this photo was taken, is well south of the "caves" area which has already been acquired. This is the most striking view in the whole of the Otonabee region.

The Indian River emerges here from its very unusual underground course in the Warsaw Caves Conservation Area

protect it from deterioration and enhance its value. Although erosion is not a serious problem so far because the woods have not been removed, there is considerable misuse of the higher, eastern cliff top by indiscriminate picnickers. At least two sections along the cliff have been used as dumps which detract from the otherwise beautiful surroundings.

The acquisition of the northern or key sector of the proposed area is a notable achievement of the Conservation Authority. The first priority for further acquisition has already been described. Next in priority comes the area down to the northern boundary of the Hydro-Electric Power Commission's easement, because good campsites can be placed in an open area just north of the easement. The sector south of the hydro easement should rate third in priority in this area.

CHAPTER 3

WALLACE POINT CONSERVATION AREA

The area of the big bend in the Otonabee River between Peterborough and Rice Lake is composed of four types of land or water. These are:

- (1) The Otonabee River with several swampy backwaters.
- (2) A series of drumlins.
- (3) Patches of dry woodland.
- (4) Larger areas of wet woodland.

The whole area possesses a definite attraction, although there are many swampy and wet woodland sites which have a low recreation potential and which would be expensive to improve. The two elements of the area which are the prime features in any development for recreation here are the river and the drumlins. The places where these two meet are the choicest locations for recreational development. The drumlins provide firm, steeply sloping banks, well drained picnic and campsites, impressive views, and building sites beyond the reach of flood water. The river provides facilities for swimming and boating. The backwaters are not of any great value except for the wildlife which they produce or harbour. If they were dredged the process would have to be regularly repeated. The backwaters are, in their present state, of great interest to the growing number of naturalists in the region.

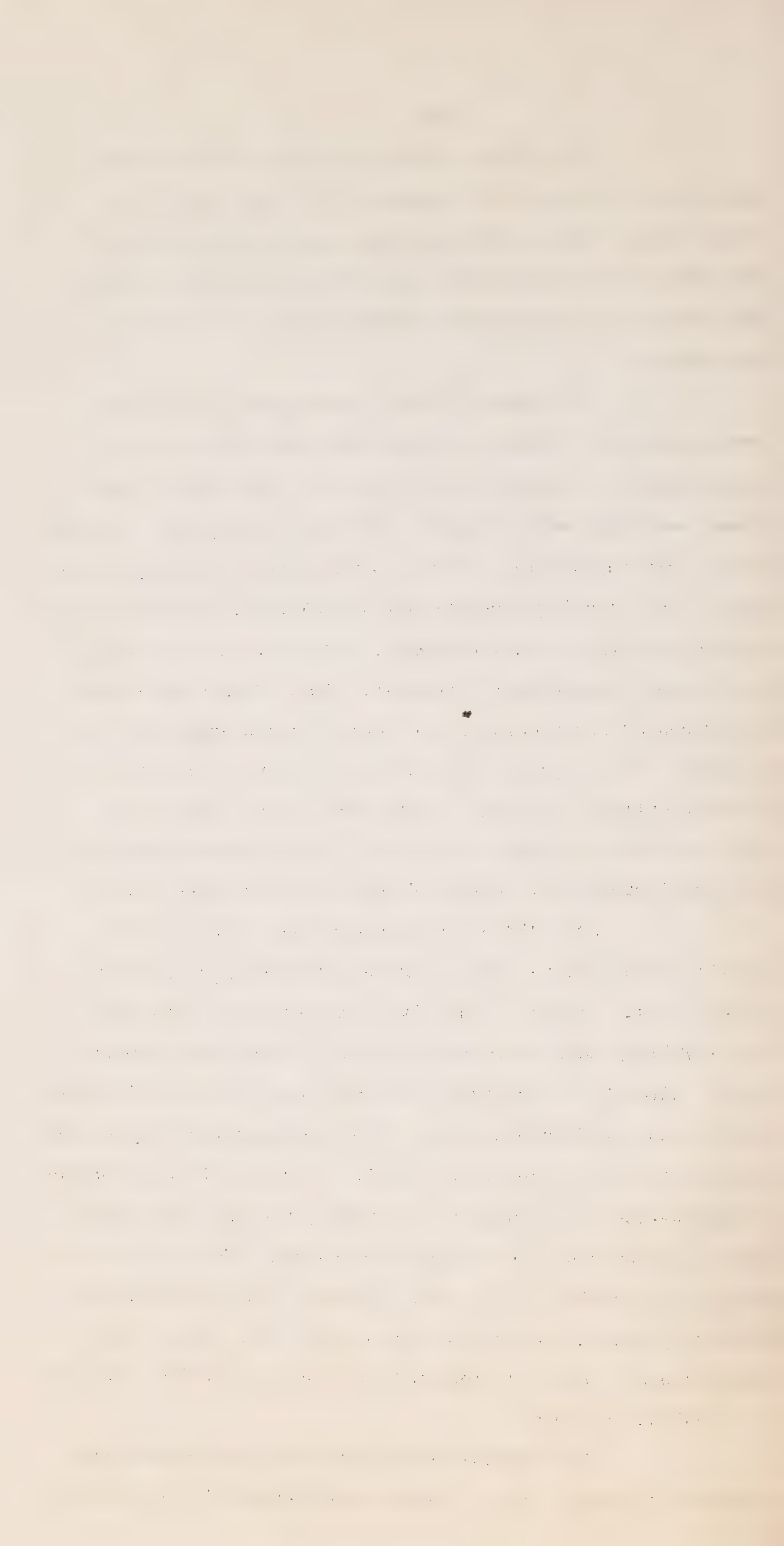
The drumlins, then, are seen to be the key sites in the development of the area for recreation. Most of the dry sites along the river are, however, already taken up, at least in part, for private or commercial recreation. The costs of acquiring the whole area of the big bend would be prohibitively high. Smaller areas with their nuclei in drumlins or dry woodland sites are, therefore, briefly discussed.

The Wallace Point corner has already been extensively developed for recreation but the site is not widely known. It is sufficient here to note the price of over \$60,000 which has been asked for the 440-acre nucleus. This area is not recommended because of the high cost of acquisition.

The drumlin on the south side of the river immediately east of Wallace Point does not quite reach the river, which is flanked on this side by a very narrow band of wet woodlands which might be difficult to improve, although this is not impossible. Access to this site is very good and there is no existing recreational development. The farm house in this area is already abandoned. The site has a definite but limited recreational potential. East of this site there is an area of dry woodlands and access is now available only by water. This area is attractive in summer but is probably liable to slight flooding in occasional years. The lands here described are shown as Area "B" on the accompanying map. The area includes 301 acres, of which 147 acres are wooded.

Area "A" on the map consists chiefly of a drumlin which here reaches the river, affording a pleasant sloping bank. Access to the river is excellent, although some levelling work would be needed to provide good parking space. Already on the river slope are four cottages of varying quality and a refreshment booth. No development or improvement has taken place on the river itself. A tongue of dry woodland extends to the east along the riverside, but the large back-water is flanked by wet woodlands and marsh. The area to the west of the drumlin is also wet. However, this drumlin has the best potential for recreation on the whole river below Peterborough. Area "A" amounts to 254 acres of which 176 acres are woodland or marsh.

The drumlins lower down the river margin were examined in detail. In all cases either access to the drumlin



PROPOSED WALLACE POINT CONSERVATION AREA

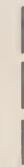
LEGEND



BUILDINGS



WOODLAND



BOUNDARY OF AREAS "A" and "B"

O T O N A B E E T O W N S H I P

CON. XVII.

CON. XVI.

CON. XV.

CON. XIV.

TO PETERBOROUGH

LOT 12

N

CON. X
CON. XI

A

B

S O U T H
RIVER

M O N A G H A N

CON. IV

LOT 7

LOT 8

LOT 9

LOT 10

LOT 11

LOT 12

LOT 13

LOT 14

P

T

O

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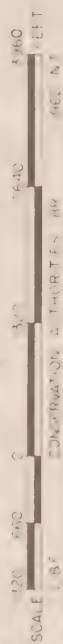
S

H

I

P

SWING BRIDGE



is difficult or the shores consist only of wet woodlands.

It becomes apparent that the whole stretch of river under consideration has been carefully looked over by private interests and most of the attractive sites accessible by road or water have been taken up. Few opportunities remain to acquire attractive sites for public use.

It is recommended that immediate steps be taken to acquire those parts of Area "A" which are not already built on, and that development should be oriented towards the river itself rather than to the backwaters, which should be left in their present condition for the benefit of those who wish to observe or harvest wildlife.

Options might be obtained on a part or all of Area "B" to allow for expansion of facilities if the demand warrants it. Concerning the occasional spring flooding of the banks in certain parts of both Areas "A" and "B", it should be noted that this condition exists as a natural hazard in various other Conservation Areas in the Province, without detracting permanently from the benefits which accrue during the summer.

The provision of parking space, picnic tables, dock space and outside conveniences are the primary requirements for recreation areas. When public demand warrants it, a shelter could be built which, incidentally, would command a magnificent view of the river.

Both Area "A" and Area "B" have long water frontages on the Trent Canal system. While the Trent Canal system controls the river-bed itself, it has no control over development or activity on the banks in this area. There is usually no objection to the construction of a small private wharf or dock, although technically, Section 4 of The Navigable Waters Protection Act (Revised Statutes of Canada 1952, Chapter 193) makes it illegal to build or place a "work"

under, in, or over a navigable water unless the Federal Minister of Public Works has first approved the site and plan of the "work". However, all "commercial" developers must take out water lots and must in general work in conformity with The Navigable Waters Protection Act. Detailed requirements can be secured from the office of the Trent Canal system in Peterborough.

CHAPTER 4

THE MOUNT PLEASANT CONSERVATION AREA AND COMMUNITY POND

This recommended area includes land in Lots 14 and 15 of Concession XIV, Cavan Township, in the County of Durham. Involved in this property are a mill pond, a mill dam, some surrounding woodland west of the road crossing near the Best mill, and the remains of the old mill, some surrounding land and three utility buildings associated with the mill.

The total of land recommended as a Conservation Area amounts to approximately 37 acres. Jackson Creek passes through the property, feeding the pond and flowing over the dam, passing between the mill building and the miller's house on its way to Peterborough. A township road separates the pond from the buildings and provides a bridge over the dam. The western boundary of the proposed acquisition is the centre line of Lot 14.

The village of Mount Pleasant lies a little more than a mile west of the property, and gives its name to the proposed project.

1. Access

Peterborough residents have easy access to the site along Highways No. 28 and No. 7A west to Highway No. 133 at the Five Mile Turn, and thence north to the first concession road (Concession XIV) which brings them within a quarter of a mile of the property. The distance from Peterborough is about 10 miles. For the residents close to the area, the location is between the Durham-Victoria County Line and the 14th Concession Line of Cavan Township, one mile east of a county road which links Mount Pleasant with Highway No. 7, about three miles to the north.

2. Woodland

White cedar trees of diameters from 4 to 10 inches form the chief component of the woodlands, which almost

PROPOSED
MOUNT PLEASANT
CONSERVATION AREA

LEGEND
----- BOUNDARY OF RECOMMENDED AREA
WOODLAND



completely surround the pond. White birch, ash and maple also occur in these woodlands. Close to the south-west bank of the pond there is a stand of white elm and basswood with scattered white ash and hard maple.

3. Open Land

Little open land is involved in the proposed acquisition. Two small fields which have little agricultural value front on the township road which separates the pond from the buildings. The project lies in the centre of the Peterborough series of drumlins, where the topography limits the use of land for agricultural purposes. Even if the affected land were, from the condition of the soil, suited for farming, its small size and its location make its use as a part of a Conservation Area no great loss from the standpoint of crop production. Its present use is as pasture. The remaining small segment of open land surrounds the buildings adjacent to the creek east of the township road.

4. Buildings

There are four buildings on the property, two on each side of the township road. The mill itself has been partially dismantled, with none of its internal machinery left in working condition. The three others on the site are utility buildings. The two on the north side of the creek have been used respectively as a stable and chicken house. They are in fair condition. There are some excellent timbers in the old mill building. The land around the mill site slopes to the east and is partially in the flood plain of the creek between two small hills. There are white cedar trees around the building and along the creek below the dam. The creek is here very attractive with minor rapids.

5. Other Features

There is a log revetment which prevents erosion of the streambank below the dam. This structure has been in



A view of the pond in the proposed Mount Pleasant Conservation area showing (Right) the main structure in which the machinery was housed. The mill pond is now shallow and silted but could be easily deepened with a dragline.



Jackson Creek, looking downstream below the mill pond in the proposed Mount Pleasant Conservation area.

place for many years and has "weathered" considerably. An old footbridge across the creek connects the miller's residence to the mill itself. This footbridge, which consists of wooden planks and wooden handrails, gives a pleasant view of the dam and stop-logs on the one side and of the creek amongst the cedars on the other side.

6. The Dam

There have been some repairs to the dam in recent years by the Township. The wing walls were replaced and a new bridge was built which acts as a part of the superstructure of the dam. The wooden timbers which hold the stop-logs in place appear to be in fair condition. Access to the stop-log area is provided by a wooden catwalk running across the width of the dam.

7. Objectives and Improvements

The objectives of acquiring this area include the establishment of a community pond and Conservation Area and the release of a little of the impounded water at times to reduce the pollution load on Jackson Creek. The watercourse has long been a source of problems to the citizens of Peterborough.

The first step in developing the area after acquisition of the land would be the overhaul of the stop-log section of the mill dam, and perhaps the repairing of the old mill race. It would then be possible to draw the pond down and to clean up the pond bottom, in addition to removing the cedar logs which have been left scattered along the banks and in the pond itself. This work could be carried out as a winter works project under the Federal-Provincial Winter Works Incentive Program.

The indicated areas of open land would chiefly be used as parking areas. The first parking area should provide parking for about 50 cars.

It should be possible to establish a nature trail around the periphery of the pond which would greatly increase interest in the area. Picnic tables could be set out at appropriate spots around the pond, particularly on the higher ground along the north side of it.

Wood duck nesting-boxes could be set up at the more remote westerly end of the pond. Their success could be evaluated by the Wildlife Advisory Board of the Conservation Authority.

The present footbridge below the dam should be inspected. It might be necessary to replace it or to dismantle it.

More uniform spacing of the rip-rap on the edge of the pond along the roadside might be needed.

A general clean-up operation around the buildings will be necessary to eliminate the present debris. It might even be advisable to remove one or more of the buildings in order to provide a better approach to that section of the proposed acquisition in Lot 15.

The stream which enters the pond is now classified as brook trout water. The pond is reported to have been stocked with brown trout. The Wildlife Advisory Board might consider recommending the continued stocking of the pond with either brook trout or brown trout. The pond would, of course, be much improved for trout if a part of it could be deepened with a drag line.

If the price of the proposed acquisition appears to be too high because of the value of the buildings east of the township road in Lot 15, it might be advisable to limit the purchase to that part of the property which lies west of the township road.

CHAPTER 5

THE LANG MILL CONSERVATION AREA

The proposed Conservation Area consists of approximately 47 acres of land and water lying in Lots 18 and 19, Concession VI, Otonabee Township. The area is 5 miles from Provincial Highway No. 7 and 10 miles from Peterborough.

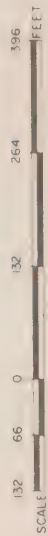
Two properties are involved in this recommendation. One of these, known as the "Rose" property, includes 27 acres of pastureland east of the Indian River along the side of the present mill pond at Lang. The other property, known as the "Clarkson" property, includes the old mill at Lang, the original log house of the miller and a utility shed near the mill, all situated on a small property west of the Indian River but including part of the mill-race. The log house and a sawmill were erected in 1825 by Thomas Short who operated the mill. The village was then called Allandale. Mr. Short built the present flour mill in 1846. Mr. Clarkson, the present owner, operated the mill for 35 years. The equipment in the mill is still in good condition and would prove to be an interesting and educational attraction for visitors. The mill itself is built of field limestone which has weathered very well. It is the most imposing landmark in this part of the watershed.

1. The Mill Dam

The present dam appears to be still in fair condition although it could be much improved by repairs. The original concrete dam was built in 1901 in three sections with three sets of stop-logs which need replacing. There are some cracks in the wing-walls. A close examination of the dam should be made by a qualified engineer before the costs of the acquisition and maintenance of the whole property are estimated.

LANG MILL CONSERVATION AREA
AND COMMUNITY POND.

 CONSERVATION AREA BOUNDARY
 WOODLAND



2. The Mill Pond

The reservoir created by the Clarkson mill dam covers about 18 acres and is one of the most important features of the entire property. It could neither be expected to provide an important storage area for flood waters nor to provide an important increase in the summer flow of the river. It may, however, raise the ground-water level in this area. Its value, apart from its present use in providing a small amount of power for the chopping activities at the mill, lies chiefly in its great contribution to the beauty of the area and in its provision of first-class swimming and fishing. With very minor improvements, including a few minutes work with a bulldozer and the addition of some washed sand, a very attractive beach usable even by small children can be made.

3. Pastureland

The 27 acres of land east of the mill pond are not of great value for pasture which is their present use. The incorporation of this area into the proposed Conservation Area would not constitute a serious loss as far as agricultural production is concerned. Weeds are major competitors with the grass in much of the pastureland. The area could easily be separated into various components for different uses. A part of the area would certainly be needed for car parking, and a part for picnic tables; and eventually a shelter would be required. Since demonstrations of conservation methods are a normal function in Conservation Areas, it would be entirely reasonable to have a tree plantation within the present pastureland. There could also be plantings of shrub species which attract birds, e.g., Silky Dogwood, Russian Olive, Caragana and other species of proven value.



A scene in the Lang Mill Conservation Area. The Lang Mill is an historic structure, built in 1846. The building is of field limestone and has weathered very well. The dam is in fair condition but some repairs are necessary, probably. This is an excellent unpolluted swimming area.



This old log house was erected in 1825 by Thomas Short who built the first mill in the proposed Lang Mill Conservation Area. The log house should certainly be preserved as an historic building.

The only woodland now remaining on the property consists of a number of clumps of white cedar along the edge of the mill pond. These lie in the pasture field already discussed.

4. The Log House

The old log house is an historic building. Very few such structures remain within the area under the Conservation Authority. It is in exceptionally good condition considering its age. Eventually a more permanent foundation could be put under it. The spectacular elm tree beside it could be sprayed to protect it against the Dutch Elm Disease.

CHAPTER 6

ADDITIONAL CONSERVATION AREAS

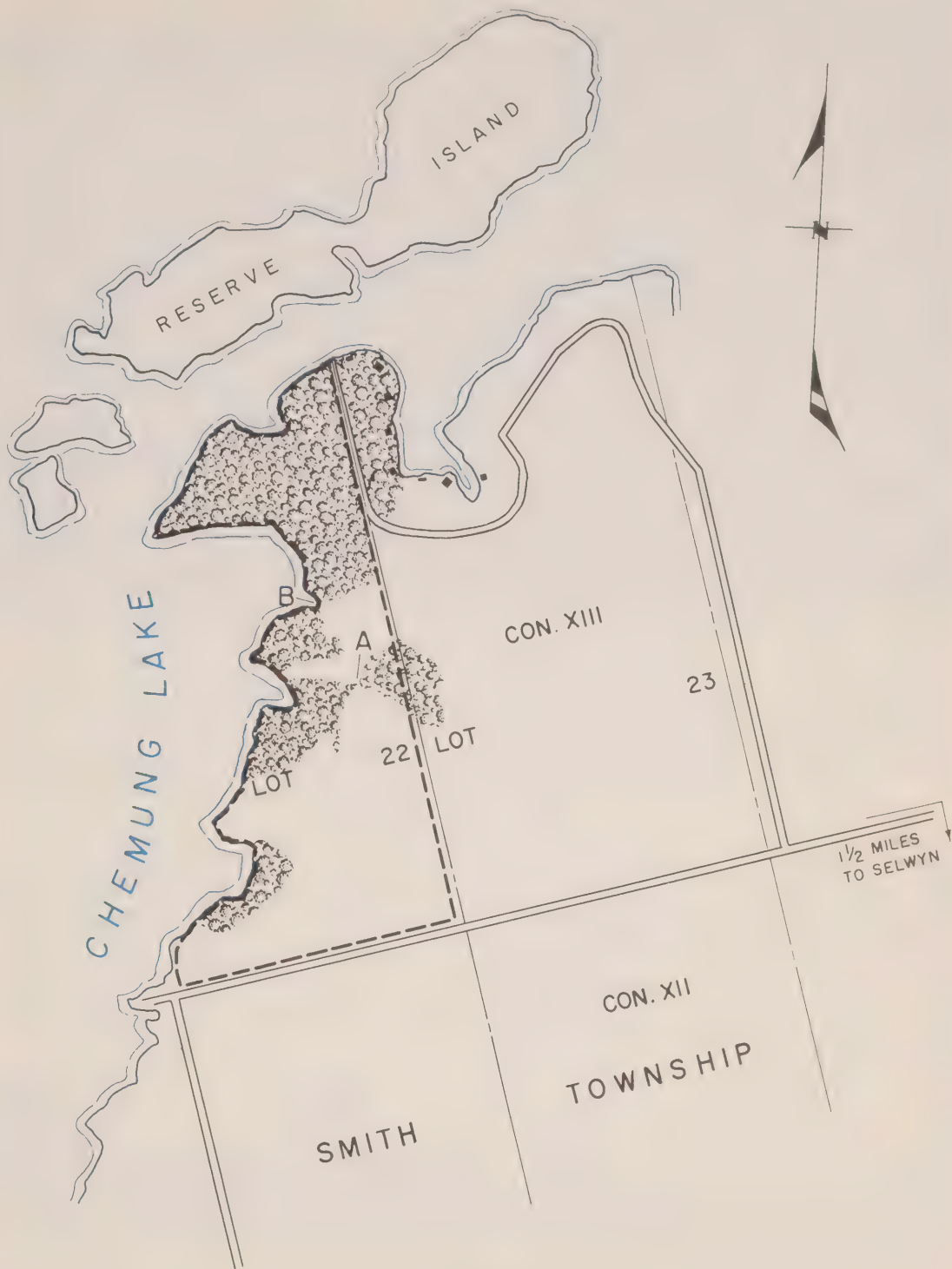
Three additional tracts are worth serious consideration for acquisition as Conservation Areas.

1. Selwyn Conservation Area

The first of these is the proposed Selwyn Conservation Area. This is an area north-west of Selwyn in Smith Township, comprising approximately 78 acres along the shore of Chemung Lake, a part of Lot 22 in Concession XIII of Smith Township. The eastern boundary of the property is the lot line between Lots 22 and 23. The whole area between this line and the shore of Chemung Lake consists of extremely poor agricultural land with large heaps of boulders in the fields and a very thin gravelly soil. The woodlands, which include 32 acres, consist chiefly of cedar stands along the shores of the lake. There is good access through a gate into the lot, approaching from the south. Already trucks may be driven with ease almost throughout the open area of the property and little grading would be needed to make a satisfactory road for cars. There is ample parking space with a firm base. At the point "A" on the accompanying plan there is a small wet spot which could be easily filled with gravel, and if necessary a small culvert could be put in.

The shores of the lake are chiefly broken limestone and it might be necessary to put a few loads of gravel and sand, preferably washed, at the point "B" at the edge of the lake, to make a good beach.

This area is the last remaining area on the east shore of Chemung Lake which has not been subdivided or is not in use as valuable agricultural land. The area immediately north-east of the property already has many cottages on it.



PROPOSED
SELWYN CONSERVATION AREA

-LEGEND-

- BOUNDARY OF RECOMMENDED AREA
WOODLAND



L 8F. CONSERVATION AUTHORITIES BRANCH T.L.L. 1962



A small clearing among the cedars along the edge of Chemung Lake gives access to the lake within the proposed Selwyn Conservation Area. The bottom in the shallows is stony but a sand beach could easily be established, making an excellent swimming and paddling area for children. Farther out in the lake, there is ample deep and clear water for swimming and diving.



Another view in the proposed Selwyn Conservation Area, showing a part of the ample parking and picnicking areas. The soil is coarse, well compacted and suitable for car parking.

There are many scattered elm and basswood trees (in addition to the cedars) which provide shade. The whole area is attractive rolling land, broken only by a few very old rail fences, several of which have gaps in them.

On the basis of its extremely low agricultural potential, this area is already recommended as a part of a much larger Authority Forest. Since the shore of Chemung Lake is so important a facility for recreation it is now recommended that the primary use of Lot 22, Concession XIV, should be for recreation. Lot 23, which is also recommended for acquisition as Authority Forest, could also be used in a controlled manner, after successful reforestation, for limited recreational uses. This is in keeping with the multiple-use concept of conservation. In the same manner it might be expected that there would be tree plantings in the Selwyn Conservation Area along with the other facilities which are standard requirements in such a Conservation Area, such as picnic tables, a swimming area, and other public conveniences.

2. The Cavan Bog

This area has already been the subject of a separate report to the Conservation Authority. It is of special interest to those interested in rare and spectacular wild flowers, particularly members of the orchid family and others characteristic of cool northern bogs with acid peat and muck soils. Most of the area is already covered with trees and shrubs, with scattered clear areas. So far as the area in which the rarest flowers occur is concerned, most of it is recommended as Authority Forest and the vegetation will be little affected. However, the section of bog and forest in Concession XII (near the north-east corner of Cavan Township) which was not recommended as Authority Forest has been recommended for acquisition as a nature preserve. This area, north of the new road which skirts

the bog, comprises approximately 112.64 acres and could be acquired as a Conservation Area. The south half of Lot 22, Concession XIII (recommended for Authority Forest) and the above-mentioned 112.64 acres should both be left in their natural state.

3. The River Road Conservation Area

It is extremely fortunate that the Department of Transport of the Government of Canada has retained title to a long narrow area along the east bank of the Otonabee River between Nassau Mills and Lakefield. This area was acquired originally as a necessary part of the construction and management of the Trent Canal system's locks Nos. 22 to 26.

It is understood that the Authority is negotiating with officers of the Trent Canal system with the objective of establishing a Conservation Area to be known as the River Road Conservation Area.

Officers of the Trent Canal system should be commended for their efforts in keeping this area clear of brush and weeds in the past, through work carried on during the fall and early spring months, and for their progressive behaviour in allowing picnic tables to be put in the area. The Conservation Authority would do well to complete the negotiations at an early date so that this area, which lies close to Peterborough and provides excellent facilities for residents, particularly of Smith and Douro Townships, will provide the maximum of outdoor recreation. The construction of the Trent University buildings near Nassau Mills will inevitably provide a great incentive to additional building in this area, and the establishment of this Conservation Area could hardly be better timed. The matter is urgent since the Trent Canal system is already considering leasing or selling property on the other side of the river.

CHAPTER 7
SCENIC DRIVE

Scenic drives in a number of Conservation Authorities have received considerable publicity and wide public acceptance. It is, of course, not the prerogative of a Conservation Authority to acquire, own or operate a scenic drive. Nevertheless, the Authority is in a better position than any individual municipality to suggest an attractive route and enlist the co-operation of municipal councils, chambers of commerce and other interested groups.

A few basic assumptions were made in laying out the proposed scenic route. These include the following:

- (1) that the route will cover a leisurely trip by car;
- (2) that the route will pass through much attractive scenery including widely varied land forms;
- (3) that the route will use many paved roads or gravelled roads in good condition and will use no really bad roads;
- (4) that the route will pass close to at least some of the proposed Conservation Areas.

The route begins at the spectacular lift lock at Peterborough and takes the road up the east side of the Otonabee River, west of the Trent Canal. Three miles from Peterborough the road reaches Nassau Mills, now a power plant but formerly the site of "the largest sawmill in the country"* (1854). Here the route crosses the canal and turns left, following the sinuous course of the river (which is here a part of the canal system) and passes the proposed River Road Conservation Area.

The road soon reaches Lakefield, now a prosperous community and formerly of special interest because of

* Poole, T.W. "Sketch of the early settlement of Peterborough". Peterborough, 1867.

its association with the history of the Strickland, Traill and Moody families. From Lakefield the route follows Provincial Highway No. 28 towards Young's Point. Two and a half miles north of Lakefield the first main road eastward is taken. This road, which is paved, passes a cheese factory and crosses the watershed through Galesburg, passing north of Long Lake, and follows the paved road to Concession III of Dummer Township.

Here the route turns south, approaching and crossing the attractive Indian River. The route passes along the edge of the Warsaw Caves Conservation Area. Three miles from this Area, Warsaw is reached and the route here crosses the Indian River twice, following the general southerly trend of the river and crossing it again twice near Jermyn. A large and interesting old ruined building known locally as "the Piggery" is passed one mile south of Jermyn. The route continues to skirt the Indian River, passing between but not over several drumlins.

A fine sawmill in good condition is reached at the Indian River four miles south of Jermyn. Lang is an attractive village with a fine old grist mill still in excellent condition. This is the location of the proposed Lang Mill Conservation Area. The route here crosses to the west side of the river and proceeds southward on a good road to Keene.

Those tourists who have not already visited the Serpent Mounds Provincial Park will wish to go to it (three miles south of Keene), both for its archaeological interest and because it offers remarkably fine views over Rice Lake and excellent picnic grounds.

From Keene the route follows a good road through Mather Corners with fine views of the many drumlins

to north and south. North of Bensfort Bridge there is a jog to right and left and the route soon reaches the big bend on the Otonabee River, where lies the proposed Wallace Point Conservation Area. This is a very attractive natural area with a potential for extensive picnic grounds, camping sites and other holiday facilities.

From Wallace Point the route continues southwest and then west, crossing Provincial Highway No. 28 and, traversing an attractive and very productive area of farmland, shortly reaches the Village of Millbrook. This village was an important local centre in the "horse and buggy" days. It is well known for its many attractive gardens and for the skilled topiary work. There are two active mills, a sawmill and a grist mill. Here the route turns north for three concessions and west again on the 8th Line of Cavan Township after crossing Highway No. 115. The route passes west to the township boundary and then north to the 12th Line of Cavan Township, here turning back eastwards, passing through extremely spectacular country which reaches an altitude of almost 1,200 feet above sea level and affording, at different times, remarkable views in all directions.

After a short jog north, the route returns easterly, skirting the northern edge of the Cavan Bog, with an excellent view of it from the side of a steep drumlin on the 13th Line of Cavan Township. Avoiding the road through the swamp, the route passes through the charming village of Mount Pleasant and passes through the proposed Mount Pleasant Conservation Area. The route reaches Peterborough again in the vicinity of Jackson Park.

